A system and a method for electronic registration of flying time and cosmic radiation

The present invention relates to a system and a method for electronic registration of flying time and cosmic radiation for pilots, flight crew and passengers (in the following altogether described as "persons" or "airborne") by use of partly central, partly transportable computers and mobile/cellular phones for the registration and the transmission of the electronic data and central computers for the processing and storage of the collected data. In this context, the term 'a computer' is to be construed a generic term including not only a single computer, but also a set of computers, including servers, networks and possibly also connections through the Internet to other computers and/or computer systems.

Throughout the world, it is a law requirement that pilots keep a detailed report of their flying time, a so-called pilot's logbook. Until today, such a log has been conducted manually by using paper and ink in the same way as an old-fashioned book-keeping system using an accountancy book with lines and columns specially designed for that purpose. On each line one flight is entered as a number of different data, such as the date, the type of flight, registration, place and time of departure, place and time of arrival, total flying time, time as Pilot in Command and First Officer, flying time night or day, single-engine or multi-engine aircrafts etc.. All these time data are to be entered in the log according to the above mentioned law requirements immediately after a flight or at least the same day.

There are no requirements stating that the flight crew must keep any kind of log and of course, nor must passengers. - It has, however, become a requirement that the employers of radiation exposed employees (in Europe so far) make annual reports of the radiation dose of the employees in connection with the execution of their profession. As for the flight crew members, the dose of ionising radiation from space and from the sun is considerable, as well as for frequent flyers (i.e. couriers or others), a fact that has caused the aviation authorities to oblige the airline companies to perform the mentioned radiation reporting for the flight crew members and to send in an annual report of the collected dose of cosmic radiation (i.e. the

sum of galactic and solar radiation) for the flight crew members to the national radiation authorities. A corresponding obligation will also be imposed to other employers, where the employees, by virtue of their profession, annually collect a dose exceeding 1 milliSievert (1 mSv). This is why passengers will also be part of a possible target group. As embryos/foetus during their development are particularly vulnerable, pregnant women will also be part of the target group.

The strict law requirements and the requirement as to the security of data registration has till now prevented the authorities from wanting to accept electronic data as sufficient documentation for the pilots total and current flying time. The background for this is that with a simple book-keeping system in a computer, it cannot to a sufficient degree be ensured in any way that modifications in the registered data can be made later on as it would immediately be the case when using for instance a PC with a spreadsheet corresponding to the above mentioned column book.

Within the relevant technical field, a technique is known where data logging is automatically performed from an aircraft and this technique, which solely relates to the logging of technical data from the computer of the aircraft, is disclosed in e.g. WO 00/55770 to which publication reference is made, and which publication is hereby included in the present specification by reference.

The technique of measuring the actual radiation exposure of the flight personnel in commercial and military aircrafts has been used in certain aircrafts in particular in the Concorde used by the companies Air France and British Airways. A technique of measuring aboard an aircraft the radiation dose is known from among others US patent 5,841,142, to which US patent reference is made and which US patent is hereby incorporated in the specific specification by reference.

Certain techniques relating to electronic logbooks and computerised maintenance and repair information techniques are described in among others published international patent application, publication No. WO 02/061629 and in European patent 0 573 171 corresponding to US patent 5,987,474, to which patent

applications and patents reference is made and which US patent is hereby incorporated in the present specification by reference.

It is an object of the present invention to provide a new technique which, by using modern computer technology, enables the substitution of the manually kept pilot's logbook, ensuring that the data logging is not subsequently modified, either intentionally or unintentionally without evidence of the correctness. However, this technique does not exclude subsequent processing of the data. At the same time, it is thus an object of the invention to provide a new technique for the registration of data input - manually or automatically - by a pilot, a flight crew member, a passenger or a substitute for one of these (e.g. the airline company in question) for a given flight with a given crew, which data input makes it possible for the authorities, among others airlines as well as aviation authorities, to control connected data and maybe to perform searches with a view to identify critical conditions, including for instance specific individuals' acting as students, instructors or pilots at given moments or in given connections and also to identify individuals reaching a limit value for cosmic radiation. In this connection it is a specific object of the invention to provide a new technique for the registration of data representing the radiation, i.e. radiation from space or the sun, which a person, whether pilot, flight crew member in general or a passenger, including a frequent flyer, which data reflect the dose that the person in question has been exposed to during a given flight and further permits an accumulation of such data for the calculation on a periodic basis, e.g. one year, of the dose which the person in question altogether has been exposed to.

It is a particular feature of the present invention to render it possible to establish a forecast of the cosmic radiation dose to which a person is to be exposed during a flight.

The above stated objects together with numerous other objects, advantages and specific features of the invention are obtained in accordance with a first aspect of the invention by a system for electronic registration of logbooks for a number of persons, including: pilots, crew members and/or passengers, which system

comprises a central computer for the registration and the processing of the electronic data representing the individual person's logbook and one or more terminals for the input of the electronic data in question,

wherein the data input into the central computer regarding a specific flight performed by a person comprises:

information on the identity of the person,

information on the flight number,

information on the time of departure and arrival and consequently the flying time as well as the places of departure and arrival of the flight,

information on the status of the specific persons during the flight, i.e. Pilot in Command, First Officer, flight engineer, instructor, student, flight crew member or passenger,

wherein the input of the data is performed by the person in question in a process comprising two steps, the first step comprising the input of the data into the terminal and control of the data in question, including correction of any erroneously input data, if any, and the second step comprising a permanent storing and data processing of the data in question in the computer, the permanent storing preventing a subsequent correction of any of the input data without leaving a trace,

wherein the input of data in the computer in the second step is performed in a process where the access to the computer is only obtained by positive verification of conformity between the identity of the person and a personal code word or password,

wherein the person obtains access to the central computer for the output of data regarding the person in question by using said personal code word or password, i.e. for the reading of the person's personal logbook, and

wherein an authority, i.e. an airline or an aviation authority obtains access to data contained in the computer regarding a specific person by using a specific first code, and obtains access to the data in the computer regarding a specific aircraft's flights by using a second code.

In accordance with the realisation being the basis of the invention, the registration of the electronic data itself in the central computer is performed by the person in question or his/her substitute in a process comprising two steps, where the writing of

the data is firstly performed by which writing it is possible to make corrections and additions, after what the actual input of data in the central computer generates a calculation of the night flying time and the radiation dose and a permanent storing which cannot subsequently be changed or modified. Further in accordance with the teachings of the invention it is important that the input itself for the permanent storing in the central computer can only be performed in the name of a specific person, e.g. a flight crew member, when the input of data takes place simultaneously with an entering of the personal code word or password of the person in question and after verification of the conformity between the identity and the personal code word or password of the crew member. This securing of input of data by using a code word or a password is similarly used in accordance with the teachings of the invention when the data is read from the central computer, ensuring at the same time as regards the saved data, that it is only the data related personally to the person in question that can subsequently be at the disposal to the person in question after the entering of the personal code word or password of the crew member in question.

As regards the authorities' necessary control of the input data, this is also possible by means of a code which makes the control of interrelated data possible, i.e. the control of data for a given flight in relation to the flight crew members having manned the flight, and the time data that the pilots in question have entered for that specific flight. In relation to the existing current wish from the authorities of controlling the course of the flights, the manning and the individuals being present such as students, instructors etc., the technique according to the present invention enables the authorities, by means of a specific code, to obtain access to read data for a given person or more specifically, a given crew member.

In accordance with another aspect of the present invention it is provided, for the compliance of the above identified objects together with numerous other objects, advantages and features which will be evident from the description below, by a system for the electronic registration of cosmic radiation of a person performing a flight, which system comprises a central computer for the registration and

processing of the electronic data representing the individual person's logbook and one or more terminals for the input of the electronic data in question,
wherein the data input in the central computer for a flight performed by the person in question comprises:

information on the identity of the specific person,
information on the date of the flight,
information on the flight number,
information on the time of departure and arrival and thus the flying time, as well as the places of departure and arrival,

wherein the input of the above mentioned data is performed by the person in question(or the person's substitute) in a process comprising two steps, where the first step comprises the actual input of the data in the terminal and control of the concerned data, including a possible correction of erroneously input data, and where the second step comprises a calculation of the radiation dose and a permanent storing of the concerned data in the computer where the permanent storing prevents any subsequent correction of the individually input data without leaving a trace,
wherein the input of the data in the computer during the above mentioned second step is performed in a process, in which the access to the computer can only be obtained by positive verification of conformity between the person's identity and a personal code word or password, and
wherein the individual person obtains access to the central computer for the reading of data for the person in question by using his personal code word or pass word.

In accordance with this second aspect of the invention, a registration of relevant data is performed with an electronic log in accordance with the same principles as described above in relation to the first aspect of the invention in order to permit a calculation of the radiation dose that a person, i.e. a pilot, a flight crew member or a passenger, including e.g. a frequent flyer, is exposed to during a given flight and an accumulated assessment of the radiation dose, which the person in question has been exposed to within a predetermined period of time, i.e. the current calendar year or the passed last twelve months. In accordance with this second aspect of the present invention the system can be combined with the system according to the first

aspect of the invention and thus in combination provide an electronic pilot logbook and a radiation dose registration unit, preferably based on the calculation programmes which are described in annex 1 and annex 2.

In the actual calculation of the accumulated dose to which a person is exposed during a flight, the data available from any observatories, such as the Apatity observatory on the Kola peninsula in Russia, and may particularly be processed in the CARI-6 programme described below in the Annex 1 and Annex 2 or alternatively, dosimetric data from more than one observatory or more than one server may be used in combination in order to improve the accuracy of the calculation programme. The dosimetric data may further be used for providing a forecast by averaging the dosimetric data for a previous period of time and by calculating on a simulation flight from one location to another in accordance with a previous flight, or in accordance with an average of a plurality of previous flights, the accumulated dose which a person may expect to be subjected to in a future flight from the one location in question to the other location in question.

A particular aspect of the present invention relates to the actual calculation of the accumulated dose to which a person is exposed during a light and this aspect being constituting a separate and independent aspect involves the following calculations:

1. a great circle arc is created between the airport of departure and the airport of arrival
2. the arc is divided in a number of pieces which correspond to the same number of minutes of the flight
3. the position and altitude are calculated according to each point of the great circle arc
4. the radiation per hour is calculated in the reference point with the neutron counting number of the time by means of the function with the constants as indicated in Table 4, where the relevant constants are selected from the calculated altitude of the aircraft (cf. the profile of the aircraft) at the time in question
5. the radiation power is corrected to the calculated position by getting the quotient for the actual position/altitude from the position database,

and multiplying the radiation power of the reference point with the quotient.

6. the radiation dose is calculated as 1/60 of the result from point 5.

7. the time of sunrise and sunset in the point in question is calculated, and it is subsequently decided whether the latest minute of flying is to be characterised as "Flying time day" or "Flying time night".

8. when this is done for each of the many points of the route, the partial doses are summed up to the whole of the dose of the flight

9. the dose of the flight is distributed to each of the crew members which are indicated on the crew list. - Details about the flight are furthermore indicated to the pilots, which is required by the rules for the keeping of flying time. For the rest of the crew members, including so-called passive transfers (crew members to/from active service from/to their base), flight information, which is necessary for identifying the flight in question later on, is indicated.

10. For pilots, the flying time, when on service, is summed up including accumulated "Flying time day" and accumulated "Flying time night". For a pilot who has been on board as a passenger (passive transfer), only the radiation columns are summed up. For all others (flight crew members and passengers), all the columns are summed up.

The actual calculation of the radiation dose is preferably performed by using a network defining a number of points in relation to the longitude, latitude and the altitude and possibly in combination with a GPS unit, which continuously or periodically performs a measuring of the position of the person in question or of the aircraft in which the person is situated in relation to longitude, latitude and the altitude. Alternatively, the distinct navigation system of the aircraft itself can be connected to the system according to the present invention for the transmission of data representing the aircraft and thus the exact position of the person. Similarly, other data systems in force, including the operating systems of the airline companies, can be connected to the electronic logbook or the system according to the present invention for the transmission of relevant data to both the electronic

logbook as well as the radiation dose calculation system according to the second aspect of the present invention.

In accordance with a third aspect of the present invention, a method for the electronic registration of logbooks for persons, including: pilots, crew members and/or passengers by using a computer system comprising a central computer for the registration and the calculation of the electronic data representing the individual person's logbook and one or more terminals for the input of the concerned electronic data, which method comprises the input of data into the central computer for a flight performed by a person comprising:

information on the identity of the person,
information on the date of the flight,
Information on the flight number,
information on the time of departure and arrival and consequently on the duration of the flight and information on the places of departure and arrival,
information on the type of flight (e.g. scheduled flight, training, military etc.)
information on the status of the person during the flight, i.e. Pilot in Command, First Officer, flight engineer, instructor, student, flight crew member or passenger,

wherein the input of the data is performed by the person in question is carried out in a process comprising two steps, the first step comprising the input of the data into the terminal and control of the data in question, including any correction of erroneously input data, and the second step comprising the calculation of night flying time and the radiation dose as well as a permanent storing of the data in question in the computer, the permanent storing preventing a possible subsequent correction of the input data without leaving a trace,

wherein the input of the data in the computer during the above mentioned second step is performed in a process, in which the access to the computer is only obtained by positive verification of conformity between the identity of the person and a personal code word or password,

wherein the person obtains access to the central computer for the reading of data about the person in question, i.e. output of the personal pilot logbook of the person in question, by using his personal code word or password, and
wherein an aviation authority, i.e. an airline company or an aviation authority obtains access to data contained in the computer regarding a specific person by using a specific first code, and obtains access to the data in the computer regarding a specific aircraft's flights by using a second code.

In accordance with a fourth aspect of the present invention, a method for the electronic registration of cosmic radiation for a person performing a flight is provided to comply with the above mentioned objects together with numerous other objects, advantages and features which will appear from the description below, by using a computer system comprising a central computer for the calculation and registration of the electronic data representing each specific person's logbook and one or more terminals for the input of the concerned electronic data, which method comprises the input of data to the central computer for a flight performed by a person, comprising:

information on the identity of the specific person,
information on the date of the flight,
information on the flight number,
information on the time of departure and arrival and thus the duration of the flight, as well as the places of departure and arrival,

wherein the input of the above mentioned data is performed by the specific person (or the person's substitute) in a process comprising two steps, where the first step comprises the actual input of the data in the terminal and control of the concerned data, including any correction of erroneously input data, and where the second step comprises the calculation of the radiation dose and also a permanent storing of the concerned data in the computer, where the permanent storing prevents any subsequent correction of the concerned input data without leaving a trace,
wherein the input of data in the computer during the above mentioned second step is carried out in one process, where the access to the computer can only be obtained by positive verification of conformity between the person's identity and a personal code word or password,

wherein the specific person obtains access to the central computer for the output of data for the mentioned person by using his/her personal code word or password.

In accordance with the teachings at the basis of the invention, the computer system can be implemented either as a PC or other terminal based system, where the individual PC when entering data from a data carrying medium, such as a CD, a DVD, a disk or from the Internet, is upgraded with a control programme to perform the input procedure, i.e. the input of the data into the central computer by using the code word or password verifying the authenticity of the crew member. Alternatively, the computer system can be configurated as a PC or a similar net-connected electronic data registration unit, such as a personal organiser, a WAP telephone, which via a mobile interface is used for the input of the data into the central computer via the Internet connection.

The actual control programme input of data can, as already mentioned, be performed either via a data carrying medium or by downloading the control programme from the Internet, this downloading naturally presupposing verification of the crew member's authenticity by using a personal code word or a password.

Regarding the security aspects of the present invention, the following is to be noticed in particular.

1. The entering of the flying time is performed in the same way as in business accounts: the entries are made in a cash draft which is recorded after correcting errors, if any, i.e. they are transferred to the logbook itself, from which erasures and corrections cannot be made without leaving traces - se below.
2. The flying time data are stored on the Internet and cannot be erased. However, the entries can be deactivated in order not to be part of the continuous summing up of flying time, and furthermore they appear from the printout of the logbook on a light grey background.
3. All the entries are provided with two dates: the date of the flight and the date of the entry of the flight into the logbook or the date of a correction/deactivation, if any.

4. The crew member receives a password which is a condition for being able to register the flights and to print out data. This password is generated on the basis of the crew member's personal basic data, by which it will be excluded that a printout from a logbook can take place with a name which is not connected with the logbook in question.

5. The authorities receive a password that gives access to reading, and only reading, the logbooks belonging to the crew members certified in the country in question or on active service on a flight registered in the country in question.

6. In certain cases, as in the event of terrorism or a suspicion of terrorism, a password can be assigned to a single authority, giving access to the data of all crew members, irrespective of their nationality.

7. The pilot can indicate in his basic data whether he wishes to place his data at the disposal for a job database. The airline companies are (against payment if convenient) offered a password, which gives them access to search the job database for pilots, which have to meet certain requirements, among others regarding flying time, aircraft types, age, language etc., whereupon the system can send an invitation to all those who meet the requirements to apply for the position available. The individual airline company will not have any knowledge concerning names or addresses or other identification of the recipients, which leaves the individual log keeper with his/her anonymity.

8. All printouts, e.g. LogBook Printout and Recent Flight Experience Printout are provided with a Code of Authenticity. This code is generated on the basis of the date of birth of the pilot, the date of the printout and the number of flight hours. A programme is placed at the disposal to the authorities, which programme permits the decryption or the decoding of the mentioned code with the purpose of unambiguously identifying the concerned printout as being correctly printed out in accordance with the technology according to the present invention.

The use of a personal code word or password serves the primary purpose, as already mentioned, of ensuring the aviation authorities that no manipulations concerning the name or the data in the given pilot's logbook can take place. Hereby, the following advantages are obtained:

1. Manipulation with data is not possible.
2. Corrections in the logbook can not be made.
3. Erased flights clearly appear, but do of course not enter into the counting.
4. Name, personal number and serial number of the programme appear from all of the printouts, which are thereby only valid for the specific crew member who owns the logbook.
5. The printout RECENT FLIGHT EXPERIENCE can not be imitated by the crew member without the crew member making the comparison being aware of clearly committing a crime. As the printout has to be signed by the owner of the logbook in order to be valid, it is at the same time a crime carrying the signature of the criminal.
6. When using an "old-fashioned" logbook you normally only bring the latest one, even though you are in possession of several logbooks, whereas in the present case, documentation for the whole of the pilot's flying career is automatically brought along, which can be read from any computer with a connection to the Internet by using the correct code word or password. This means that the aviation authorities can easily perform the searches which may be necessary for a standard spot check control or for a more specific control of the flights in case of accidents or if there is a suspicion of manipulation with flight times.
7. In case of e.g. theft or an accident resulting in fire, or other conditions where the logbook is lost, it is easy to reproduce a new printout of the logbook.

In accordance with the technology according to the present invention it is furthermore preferred that the data input into the central computer further comprise information about a flight in a fog or other weather with low visibility (IFR) and whether the flight can be characterised as "Cross-Country", and any information or remarks relating to technical matters or other matters during the flight, while the part of the flight being carried out while the centre of the sun at sea level was 6 degrees or more under the horizon (night flying time), is calculated by the programme. - The dose of cosmic radiation which is inflicted on the crew and the passengers of the aircraft is also calculated by the programme. This dose is added to doses accumulated during previous flights, which then results in the accumulated dose during a lifetime so far, the dose of the current calendar year, the dose of the latest current 12 months, and also the accumulated dose since the crew member in

question declared herself pregnant. It is further preferred in accordance with an advantageous embodiment of the system according to the present invention that the electronic data input into the central computer further comprise data about the individual aircraft, i.e. aircraft type, aircraft registration etc. and that the mentioned data concerning the individual aircraft, when entering the mentioned second code, is made available for an airline or an aviation authority to read. It is to be noticed that the data input in the central computer in accordance with the teachings of the present invention generally may comprise:

1. Date of the flight
2. Date of the entry/correction
3. Aircraft type
4. Aircraft registration
5. The crew members, including the owner of the logbook
6. Departure/arrival time
7. Type of flight
8. Route (place of departure, place of arrival)
9. Flying time (Blocktime)
10. The accumulated blocktime
11. The flying time which was performed as instrument flying
12. The accumulated instrument flying time
13. The part of the flight during which the owner of the logbook was P-I-C (Pilot in Command)
14. The accumulated P-I-C time
15. The part of the flight which took place in daylight
16. The accumulated daylight flying time
17. The part of the flight which took place at night
18. The accumulated night time
19. The part of the flight which took place in good weather conditions (VFR)
20. The accumulated VFR time
21. The part of the flight which took place in single engine aircrafts

22. The accumulated single engine flying time
23. The part of the flight which took place in multi engine aircrafts
24. The accumulated multi engine flying time
25. The part of the flight which took place together with an instructor
26. The accumulated time with instructor
27. The part of the flight which took place in a sailplane
28. The accumulated sailplane time
29. The part of the flight which took place in a balloon
30. The accumulated balloon flying time
31. The part of the flight which took place in an airship
32. The accumulated airship flying time
33. The part of the flight which took place in a simulator
34. The accumulated simulator flying time
35. The part of the flight which took place in a link trainer
36. The accumulated link flying time
37. The part of the flight during which the holder of the logbook was a student
38. The accumulated student flying time
39. Number of landings during day time
40. The accumulated number of day landings
41. Number of landings during night time
42. The accumulated number of night landings
43. The part of the flight during which the holder of the logbook was an instructor
44. The accumulated number of instructor flight hours
45. The calculated dose of cosmic radiation of the flight in question indicated in mikroSievert (μSv)
46. The calculated lifetime dose of cosmic radiation - indicated in milliSievert (mSv)
47. The calculated dose of cosmic radiation of the current calendar year - indicated in milliSievert (mSv)
48. The calculated dose of cosmic radiation of the latest 12 months - indicated in milliSievert (mSv)

49. The calculated dose of cosmic radiation since the delcaration of pregnancy - indicated in milliSievert (mSv)

The detailed description of the technique for the calculation of the calculated radiation doses and night flying time for each flight appears from Annex 2[1], which together with Annex 1 serves as technical description in the present patent application.

When printing out data from the central computer it is of course important to make sure that the printout is correct and not generated from any other source, e.g. a non-authorised PC belonging to the crew member or to another institution. This verification of authenticity thus serves the purpose of proving that the specific printout of the logbook stems from and is correctly generated of the central computer and thus contains the data registered in the central computer by the specific crew member. It is thus preferred that the central computer, when reading the specific crew member's logbook adds an authenticity code to the printout which is generated on the basis of data concerning the specific crew member, among others the date of birth of the crew member and the total flying time and also, if any, the date and time of the printout, as this code of authenticity when using a code decryption programme can be decrypted by the aviation authorities in order to be able to prove the authenticity of the printout.

The more detailed description of the use of the system itself and the implementation of the method according to the invention appears from the manual for the GlobaLog® data programme developed by the inventor, which manual is enclosed as Annex 1[2]. Thus, this manual serves the purpose as technical description in the present patent application.

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[1] Annex 2: GLOBALOG® The Electronic Air Crew LogBook© Teknisk redegørelse for udvikling af formler og teknik til beregning af kosmiske stråledoser og natflyvetid

[2] Annex 1: GLOBALOG® THE ELECTRONIC AIR CREW LOGBOOK© User's Manual.

Annex 1

GLOBALOG®

THE ELECTRONIC AIR CREW LOGBOOK©

Users' Manual

Contents:

Chapter 1
What is a logbook?

A logbook is a book to record facts of a certain importance. For example a ship's logbook is a permanent daily record of events during a ship's voyage like weather, position, speed and distance. – As aviation is very much related to shipping it's no wonder that airplanes have logbooks, too. An airplane's technical logbook contains flight time, number of cycles (take off and landing), technical failures of all kinds ranging from a scratch in a passenger seat to a failure of an engine.

A pilot's logbook contains information on all the flights he has conducted from his first flight as a student pilot to his routine flights as a senior captain across the continents. In order that even a private pilot is allowed to carry non-revenue passengers he must fulfill certain conditions with regard to recent experience – and even more so for a professional pilot that is responsible for perhaps hundreds of revenue passengers and goods. The documentation of recent flight experience must be available at all times when carrying out his duties as an airman. This is why he records all his flying time in a logbook together with all details about departure and arrival place and time, which particular aircraft he was flying, what type this aircraft was, how many engines the aircraft was fitted with, who were the other crewmembers, etc.

For a young pilot applying for his first job (or just applying for additional education) recent flight experience is essential. It can be extremely difficult for a young, inexperienced pilot to build up his first 1000 hours of flight time, so the logbook is usually a pilot's most important document. Each flight is entered into a line divided into columns, in which the flight time is specified into a number of ways: what was the total time of this flight? How much of this time was conducted during visual flying conditions? How much during instrument flying conditions? Was this a single engine or a multi engine flight? etc. etc. – And all along you must total these columns in order to know at any time how many flight hours you have of this type of flight.

Then at some point you feel qualified to apply for a job in the airline you have aimed for since you started your flying career. They may now have a few additional questions like how many hours do you have on widebody aircraft. Now, what kind of a question is this? In your logbook there is no column with the header WIDE BODY AIRCRAFT. But of course you know that a widebody is an aircraft like a Boeing 747 or an Airbus 320. Even if you have flown these very large and very advanced aircraft there is no official requirement that you keep track on how many hours you have on aircraft, that some people call "widebody". They are just recorded as Multi Engine Land, just as a five passenger light twin, which doesn't have much resemblance with a widebody. Or they might like to know how many hours you have on turbo jet. Strange as this may sound there is no need to record if you was a captain on an old piston powered DC3 or on a four engine turbofan jet. Both are recorded as Multi Engine Land. Now, as the deadline for the application approaches would you think its wise to spend long nights picking out just those flights your future employer finds relevant? Of course not. You would rather spend your time to write a carefully prepared application, and prepare yourself for the interview that inevitably follows.

OK, then once you get this dream job, would you then need a logbook? Yes, you would. Because the law requires it. And because every six or twelve months you must attend to a medical examination. In the beginning you will hate these examinations, but later you will learn to accept them. And later you will come to appreciate that somebody really cares in a professional way about your health. But as most pilots hate bureaucracy – we are practical people, aren't we? taking people safely from on place to another – we will also hate the forms that are to be filled out at these medicals. They ask you – as they did six months ago, too – have you been airsick, have you suffered from allergy, have you had any venereal diseases. Fair enough. But then they ask you how many flight hours do you have totally? How many hours did you fly since your last medical? Well, you were scheduled for a medical. Even after 33 years as a pilot I am still surprised by these questions and damn myself that I didn't bring my logbook. I still have to ask (shamefully): How many hours did I write last time? Well then, I probably have three hundred hours on top of this, that is I probably flew three hundred hours the last six months. I admit this is not very professional to answer so leisurely a question asked for the safety of my passengers. But as I stated above, we pilots are not bureaucrats, and what is the difference with regard to safety if I made 300 hours or 250? And what has that to do with my health?

But couldn't you just bring your logbook wherever you go? Of course you could, but as said before, a logbook is a pilot's most important personal document. And paper gets worn if you carry it everywhere.

You don't want your most important document to be worn, stained with coffee and rain water. This is also a document you would like to read and enjoy together with your grandchildren twenty years after you put your airplane down for the last time.

But as said above, the flying time is invaluable for especially young pilots. And the temptation to cheat is enormous, and not all are equally fit to resist this temptation. Probably, it does not happen very often, because in order to become a professional pilot you must be a very responsible person. If you cheat with your logbook, you are not a responsible person, and this will without any doubt show in other ways also, and at some point or another you will be sorted out. So even that cheating is not a serious problem it is obvious that the aviation authorities have to take the possibility into account. This is why accepting the electronic logbook has had some difficulties. The authorities claim that with an old fashioned paper logbook in which there are recorded false flight information they have something to bring to court as evidence (and don't doubt my words. They do take those thing to court as forgery. And rightly so, because cheating about flight safety is a serious offend). But it can be done. What could prevent someone to maintain two or three sets of the old fashioned paper logbooks? Of course these logbooks could be cross checked with other pilots' logbooks and the aircraft's technical logbooks. However, that would be quite a job. But can you imagine how easy this cross check would be, when also technical logbooks come out electronically? So if you intend to cheat, don't go electronic. And by the way, GLOBALOG® is protected very well against cheating. Of course it can be done, but then you should rather get a job in the computer software industry, because its going to require a real expert. And this kind of people are not real pilots anyway, and will never be. It's a question of morale.

I think I just mentioned GLOBALOG®. This is the answer to an easy and quick recording of your flight time. But more than this. It is also a quick way to account for your total flight time whether it goes back six months or it goes back to when a pilot was a pioneer. – You can print your logbook so you have a bunch of paper to show the aviation authorities or your grandchildren, just like an old fashioned paper logbook. In a matter of seconds you can find any flight on the screen and have it printed out if you so wish. You can find a certain flight that contains a special memory for you. And of course, you need not spend the whole night to specify how many hours you have on Widebodies.

GLOBALOG® is good for professional pilots as well as for private pilots, glider pilots, military pilots, flight simulator pilots and many others. We know that even many passengers keep a logbook. Join the club! If you feel something could be better, please let us know. We admit that though we tried to think of

everything there may be something that didn't cross our mind. Help us to make our next edition even better.

Chapter 2 Accessing GLOBALOG®

Switch on your computer. Go to www.globalog.biz.

a. **Log-in as a new user**
You will be asked a few questions. Answer them carefully, especially those about your birthday, your name, and your Social Security Number. Your password will be generated on the basis of these data. Please be aware that a person can have only one logbook. – Also be careful about your address, your telephone numbers, and your e-mail addresses, as – in your own interest and for the sake of your health – we may need to contact you. – Reading below about our calculation of cosmic radiation, our storage and administration of these data will make you understand the necessity of this.

or

b. **Submit your user name and password**
This will take you directly to your logbook for either submitting data or retrieving data. See chapter 3. – During the phase described above (Log in as a new user) you have allowed us to draw USD 6.00 each month. If for some reason you have discontinued the payments you will still be able to see your flights and do everything with them except writing new flights or correcting old flights. You can even print the whole logbook or just part of it. If you want to regain all the rights you will have to pay for the time the logbook has been inactive.

If a logbook has been inactive for two years or more it can become active again for the amount of USD 72.00. Remember, you cannot just open a new one. This is for safety reasons. And if you

have forgotten you password you can request it from GLOBALOG® by correctly answering the "secret" question from your initial log-in.

Why would you need a logbook?

If you are a pilot you have an obvious reason.

If you are not a pilot, then why?

Before explaining this, it is important for us (well, for you , too) that you understand that there is no reason, what-so-ever, that you get worried over the flying time already achieved, or the flying time you are to achieve in the future.

What we are to discuss in the following is radiation - radiation from space. It sounds like a science fiction cartoon or a computer game. It is neither. Radiation from space is a phenomenon we have known for decades, and though it has been known as a problem to astronauts it is only recently been acknowledged as a possible problem to aviation.

On Earth we are protected extremely well against this radiation by the atmosphere and especially by the magnetic field around the Earth. However, some of the radiation does reach us on the surface of the Earth. And has done so since the Big Bang 10–20 billion years ago. The radiation consists of particles that hit the atmosphere with a speed of 600 miles per second. However, this is only a very small part of the total radiation that has changed our genes since creation of the simplest of life till what we are today, human beings. Gasses, radon, from the interior of Earth makes up for a much greater part. And just for the sake of good order, man-made radiation (peaceful and not-so-peaceful nuclear power) makes up for almost nothing – around 0.5% of the total background exposure.

But understand, this is at ground level. – It's a very different thing when we climb into the atmosphere. For each 6,500 feet the cosmic radiation doubles, meaning that at 39,000 feet the cosmic radiation is 100 times what it is at sea level.

Scientists are in disagreement of how much this means to our health. But there is not much doubt that to a certain degree radiation causes certain types of cancer. With small amounts of radiation (like the

natural sea level radiation) there is a certain risk. The double amount of radiation probably doubles the risk. – Long distance flight crews will in many cases obtain three times the ground level dose, tripling the risk of those specific types of cancer. – Still, however, we are talking about rather small percentages. Nevertheless, it is generally recommended to keep the dose as low as possible.

As stated in the beginning of this subchapter, there is no reason for panic. – This is not different from so many other things that we have got used to. Take the street traffic. We all know this is dangerous, as a matter of fact, many times more dangerous than flying every day in your whole life. And nevertheless, in stead of walking half a mile in relative safety on the sidewalk, we throw ourselves into our cars and go to war in the streets – and in most cases we return safely to our homes with the milk or the bread we risked our lives to get. But most of us take certain precautions to minimize the risk we very well know is there. Like driving cautiously, like taking the car to regular maintenance to ensure that the brakes, the tires, the steering etc. is intact. We could do the same with radiation. At least we could follow the level of exposure, flight by flight, year by year. And this is exactly what GLOBALOG® does, and this is why GLOBALOG® is not only a tool for pilots. The radiation part is as important for cabin attendants, for frequent flyers, and - perhaps most important – for pregnant women. – You are encouraged to read more about all this on our home page (**www.globalog.biz**). You are also encouraged to come back to our home page now and then, as GLOBALOG® will follow up on new scientific findings. Here you will also find numerous links to articles about cosmic radiation.

The radiation strength changes from second to second. GLOBALOG® calculates your exposure on a certain flight with the radiation strength measured minute by minute. All GLOBALOG® needs to know is the airport of departure, airport of destination, flight level, and departure/arrival time (UTC) – See chapter 3.

So, whoever you are, pilot, cabin attendant, or passenger – enjoy your flight, but remember to record it in your GLOBALOG® logbook.

We have tried to make the program all that we as pilots have been missing during a long career. And though we believe we have come a long way we have no doubt that you - together with the millions of

pilots, cabin attendants, and passengers all over the world – may come up with something we didn't think about. Your ideas could easily improve the program, and your ideas could create new ideas in our heads. So, no doubt, GLOBALOG® will develop into something even better during the years ahead,

and, with new rules from the aviation authorities being implemented, new editions will be born – at no extra cost for you.

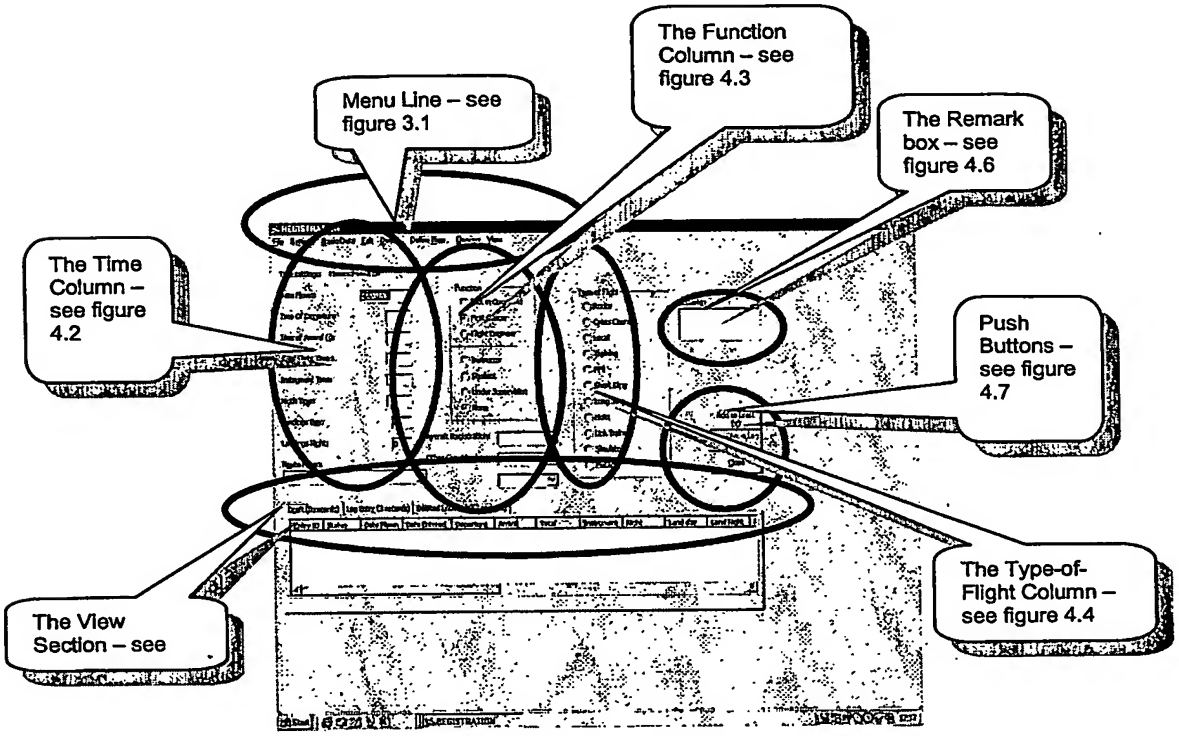


Figure 2.0 – Main Window

Getting Started

Even starting has been made easy for you. When you are about to enter your first flight the program does not yet know which type of aircraft you fly. We could of course have provided you with a long, long list of all known aircraft from fixed wings and helicopters to gliders, powered and non-powered. Instead of seeking your aircraft among thousands we thought that you would wish to define the relatively few you will be flying all your life. So this is the first thing the program takes you through in your first session. You will be required to enter at least one aircraft by now. The next thing is to define at least one other

crewmember. Why not enter your instructor, if today's flight was your first flight at the controls (if so, congratulations, pilot! – and many happy landings! Your mother will tell you: low and slow. Don't!).

Which information to enter about both, aircraft and other crewmember, will be explained in para 3.3 of chapter 3. So far just follow the instructions on the screen.

The main window is the central part of the program. Here you enter your flights as soon as you get home. From here you go to any other part of the logbook, if you need to. However, it will not be very often this is necessary. Only if you want the most recent pages of your logbook printed out, or if you want to "play" with the statistics you will need to leave the main screen.

As shown in Figure 2.0 the main window is divided into a number of separate sections:

1. The Menu Line
2. The Time Column
3. The Function Column
4. The Type of Flight Column
5. The View Section

The menu line will be dedicated its own chapter (3).
The Time, Function, and Type of Flight columns are described together with the Remark Box and the Push Buttons in chapter 4.
The Query function of the Menu Line will have a rather light description in chapter 3, but will be treated as it deserves in chapter 5.
Finally, the View Section of the Main Screen will be described together with the View Function of the Menu Line in chapter 3.
In addition to these sections there is a small window for remarks about the flight and three buttons which will be described in this chapter, also.

Typing data into the logbook is considered the main task because updating the logbook is at task carried out very often – for professional pilots every day. In some countries it is required by law that the updating is done immediately after the flight. This task is performed efficiently and easily with GLOBALOG®.

Chapter 3
The Menu Line

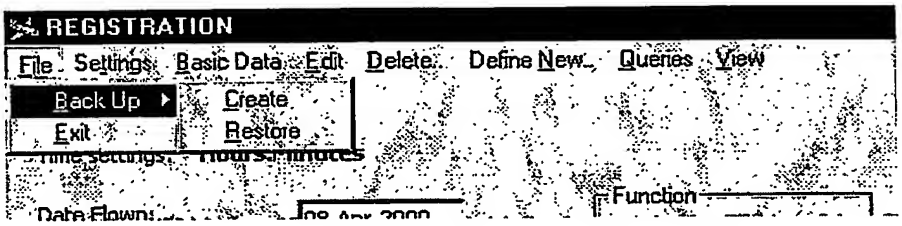


Figure 3.1. The Menu Line - File

3.1. The FILE selection of the menu has two options:

1. Back Up
2. Exit

3.1.1. File – Back Up

With the cursor on Back Up you are offered two choices:

1. Create
2. Restore

3.1.1.1 File – Back Up – Create

Select this option if you wish to create a back up of your database on a diskette to carry with you during flight. This is interesting only if you fly in a region where access to the Internet is not yet possible. In some countries the authorities are provided with a special version of the program enabling them to read any back up created by GLOBALOG® without the use of a password. So, if a representative of the aviation authorities ask for your logbook he is in his good right to take your back up diskette with him to his office for further

Inspection. As it is in everybody's best interest that nobody cheats with something so important as recent flight experience we have made cheating almost impossible, and we have made discovery of those that try anyway easier. After this, is it necessary to mention, that transferring somebody else's back up into your logbook is just not possible. Your basic information like name, social security number and password is integrated into the flight data, making any mix up of data impossible (that is if you want your logbook to print out in your own name).

When selecting this option follow the instructions on the screen. Normally you would like to create your back up on a diskette, why you would accept the default destination a:\, but you can also select any other path.

Normally, it is not necessary to back up your data, as this is done at **GLOBALOG®** once every day.

3.1.1.2. File – Back Up – Restore

This feature no longer exists.

3.1.2. File – Exit

One of many ways to leave the program. You could also use the X at the upper right corner of the screen, or you could press the Close button in the push button section (se para 3.7 of this chapter).

3.2. Menu Line – Settings

You have three options:

1. TimeSet
2. Type of Flight Settings
3. Function Settings

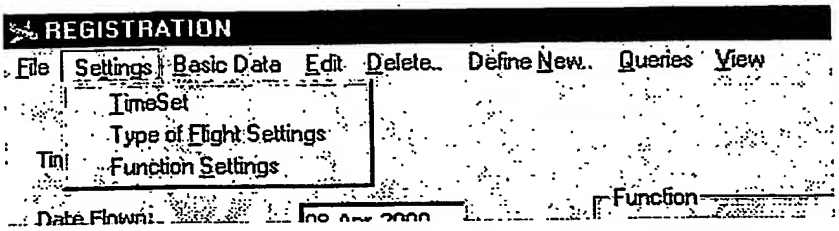


Figure 3.2 – Menu Line - Settings

3.2.1. TimeSet

The TimeSet option enables you to select whether you would like to enter your flying times in the Hour.DecimalHours format or as Hours:Minutes. – Your logbook will appear in the format you choose here. However, the Recent Flight Experience (see Figure 3.7.2.) will always appear in the Hours.DecimalHours format.

3.2.2. Type of Flight Settings

We have gone to the extremes to make your daily keeping of the logbook quick and easy. So instead of choosing Type of Flight each and every time you enter a flight, you choose the type of flight that is most common for you. For an airline pilot this will typically be "Route", while for a private pilot building up time for a commercial certificate it could be "Cross Country" or for a helicopter pilot it could be Long (or Short) Sling. – Just press ENTER to accept the default, or move the selection up/down with ARROW UP or ARROW DOWN.

3.2.3. Function Setting

Again, in order to save your time by just pressing ENTER for selecting the default of your function as Pilot-in-Command or First Officer or Flight Engineer, we have given you the opportunity of making one of these choices default.

3.3. Basic Data

You have four choices:

1. Certificates and Drills
2. Personal Data
3. A/C Types
4. Crew

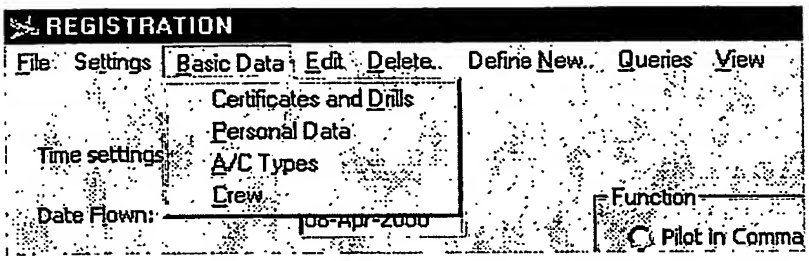


Figure 3.3. – Basic Data

3.3.1. Certificates and Drills

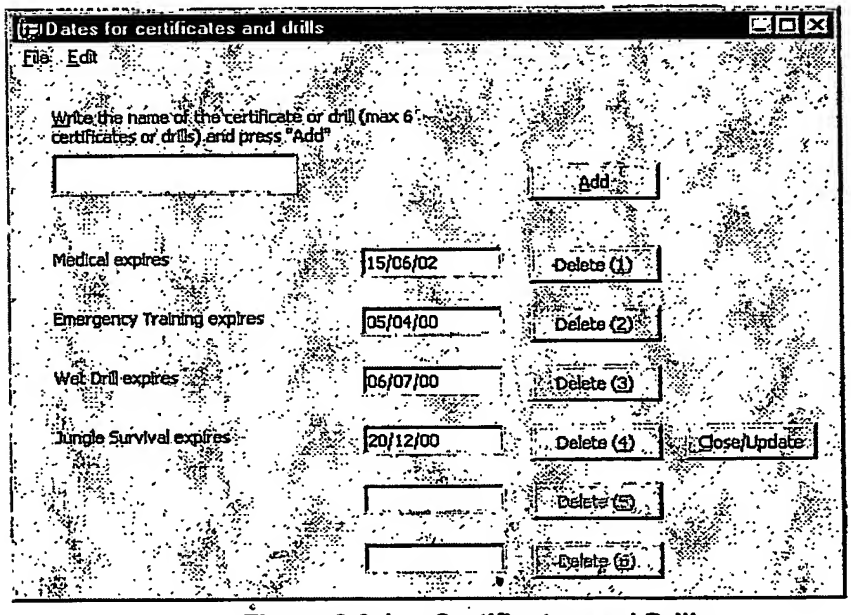


Figure 3.3.1. – Certificates and Drills

In this section of the logbook you should maintain a record of all the training and PFT's you receive from your company or your flying club with the dates of when this training becomes obsolete. – The information contained in this section will print out on the sheet of Recent Flight Experience, which we urge you to print out every time you have made a new entry in your logbook.

3.3.2. Personal Data

Select this option to enter your certificates, certificate numbers, and the expiration dates for your certificates. Also your full name and your social security number (or whatever is used by the authorities of your country to identify you unambiguously).

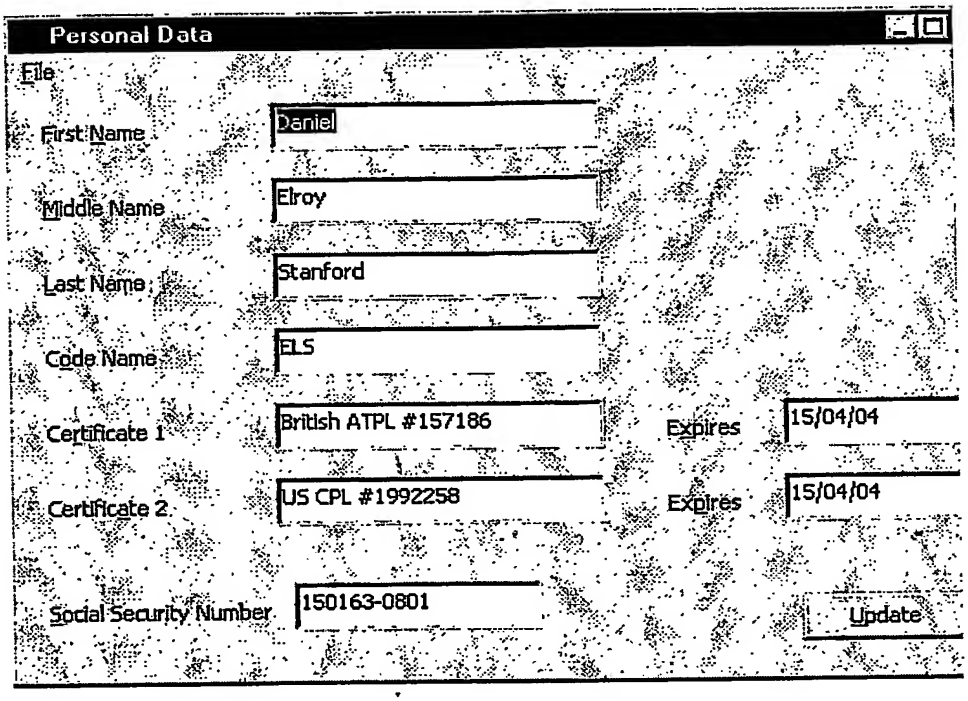


Figure 3.3.2. – Personal Data

3.3.3. A/C Types

3.3.3.1. A/C Type (Long)

Here you type the full name of the aircraft you want to define.

Example: Boeing 737-400

3.3.3.2. A/C Type (Short)

Here you type the ICAO abbreviation of the aircraft you want to define.

Example: B737

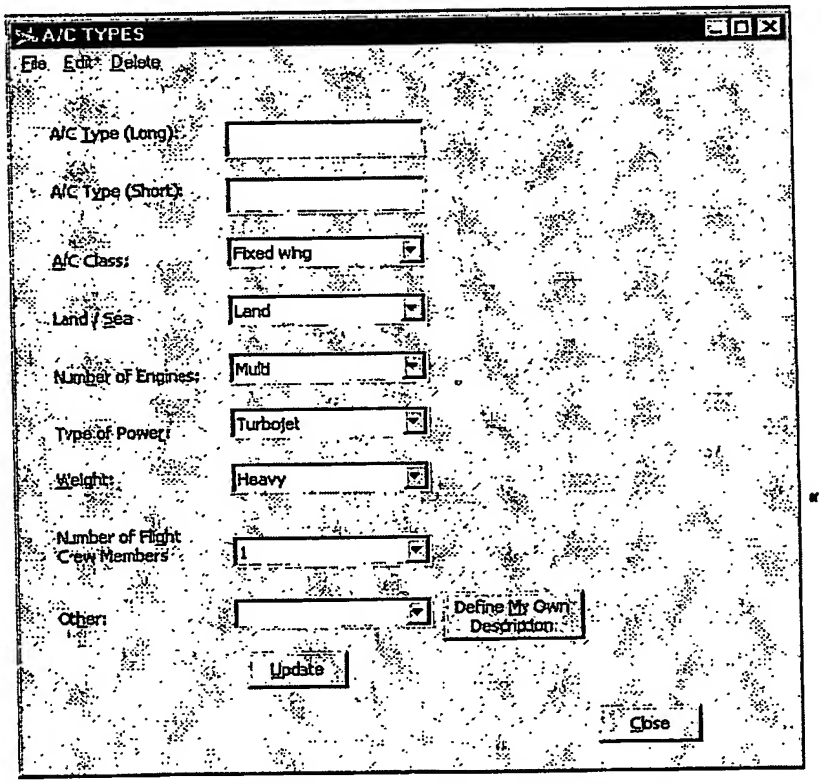


Figure 3.3.3. – Menu – Basic Data – A/C Types

3.3.3.3. A/C Class

Click on the small arrow to the right of the field. You will now have the choice of seven possibilities: Airship, Balloon, Fixed Wing, Non-powered Glider, Powered Glider, Rotary Wing, Ultra Light.

3.3.3.4. Land/Sea

Click on the small arrow to the right of the field. You will now have the choice of two possibilities: Land, Sea.

3.3.3.5. Number of Engines

Well, you are not supposed to type how many engines your aircraft has, as one might think, rather click on the small arrow to the right of the field. You will now have the choice of three possibilities: None, Single, Multi.

3.3.3.6. Type of Power

Again, Click on the small arrow to the right of the field. You will now have the choice of four possibilities: None, Piston, Turboprop, Turbojet.

3.3.3.7. Weight

No, don't type the weight of the aircraft. Again, Click on the small arrow to the right of the field. You will now have the choice of three possibilities: Light, Medium, Heavy

3.3.3.8. Number of Flight Crew Members

Click on the small arrow to the right of the field. You will now have the choice of three possibilities: 1, 2, or 3. This is the number of crewmembers required by the authorities to fly this particular aircraft. Again, this is part of our effort to save you time – just a second or two – at your daily task of logging your flights, because from now on the computer knows how many crewmember names to ask for. Why ask for three crewmembers on a two crewmember aircraft making you take a second of your time to skip the field, when the computer does it in no time?

3.3.3.9. Other

Here you can define your own criteria.

If your ambitions are to get into a major airline, be sure that one of the questions in their questionnaire says: State your experience on widebody aircraft. You could of course use your next stand by to go through the whole logbook to mark all your flights on B747, L1011, Airbus etc. With your **GLOBALOG** logbook you can just search on the criterion WIDEBODY.

If you are a private pilot renting aircraft from three different flying clubs and pay for the hours flown every month, you just define the Cessna 172 as three different types of aircraft, each with the name of the flying club as an extra criterion. You can then seek on each of the three "types", and if you wish, you can seek on C172 and get the total flight time for this type.

3.3.4. Menu – Basic Data – Crew

3.3.4.1. Menu – Basic Data – Crew (existing crew member)

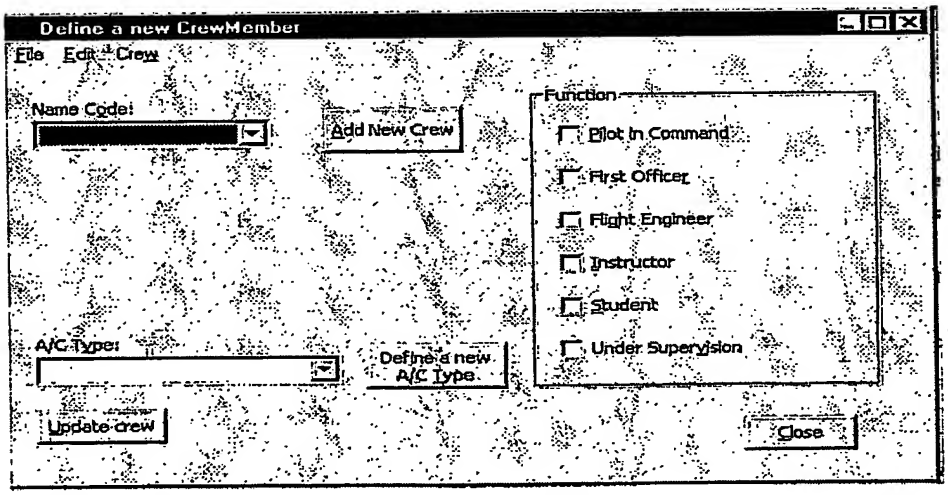


Figure 3.3.4.1. – Define CrewMember Functions

A form appears on the screen. At the field NAME CODE select one of the already defined crewmembers. This crew member can now be redefined for an additional A/C Type or be upgraded (or of course downgraded) to a higher (or a lower function).

You will probably never need it, but you can also upgrade the crewmember to an A/C Type you have not yet defined. Just click on the DEFINE A NEW A/C TYPE push button, define the new A/C Type as described above, and come back and fix the grade of the new crewmember.

3.3.4.2. Menu – Basic Data – Crew (new crew member)

If you press the push button ADD NEW CREW a new form pops up. You may wonder if you have not already seen this form before – because you have. That was when you started the program the first time and you had to define at least one crewmember (at that time we suggested your instructor).

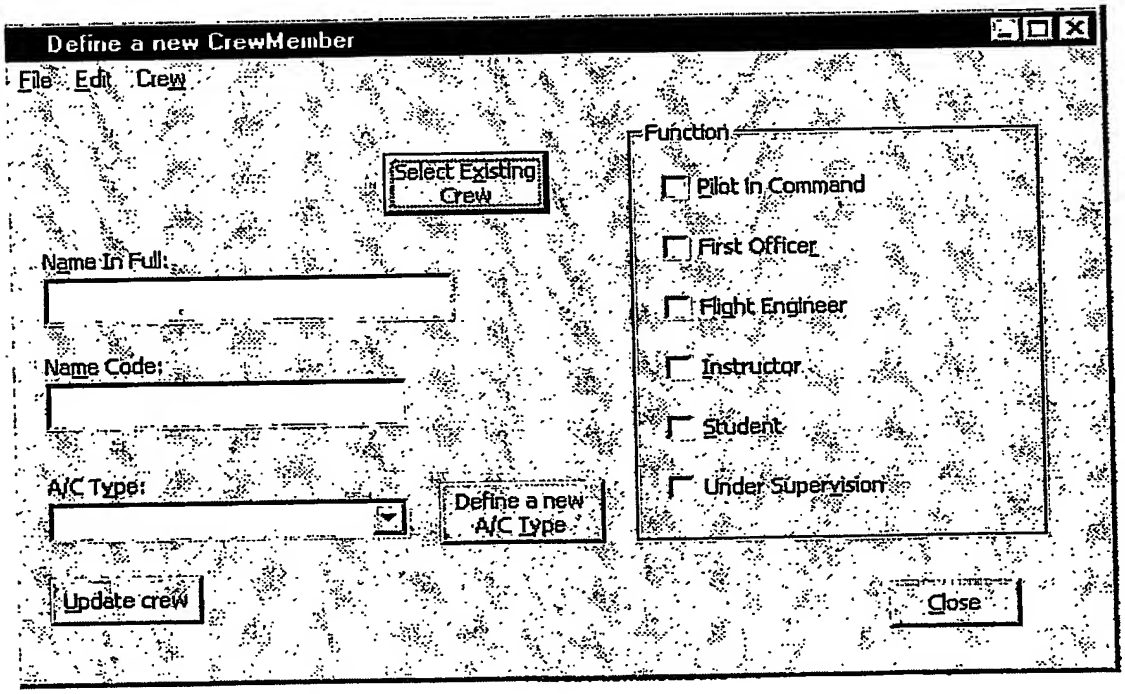


Figure 3.3.4.1. – Define New Crewmembers

Press the pushbutton SELECT EXISTING CREW to get back or DEFINE NEW A/C TYPE to get into that form.

When done with the definition of the new crew member push UPDATE CREW.

By the way, we have taken the freedom to assume that you know your own grade. So you need not to define yourself as a crewmember. When you click on the radio button, Pilot in Command, on the function column (read about this later in xxxxxx), it is because you was a functioning Pilot- in-Command, and that was probably because you were licensed to this function. This program is a logbook and though it without any doubt is the world's best electronic logbook, it is not a licensing tool (alas, if it only were that easy!).

3.4. Edit

You have two choices:

1. Add to Draft
2. Edit in Draft

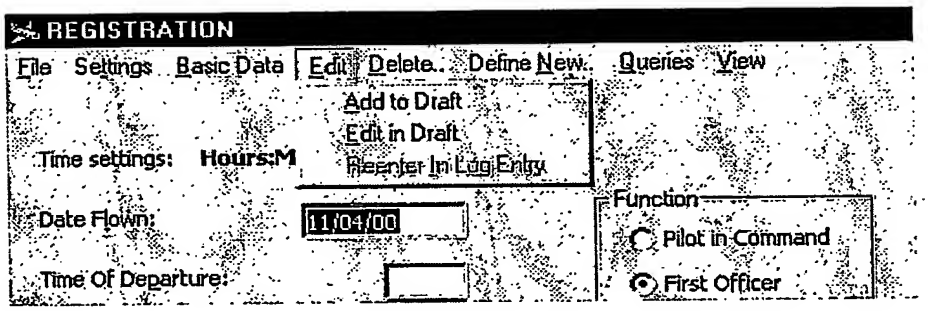


Figure 3.4. - Edit

3.4.1. Add to Draft

One of the requirements that the authorities have been standing hard on is the requirement that it should not be possible to make corrections in a logbook without leaving any traces of the original entry. And rightly so, this is no different than any other accountancy book. However, we are all humans, and as humans we do mistakes more often than we like. As a pilot you will sometimes find yourself in a situation where there is no possibility of regretting, or at least there is no possibility of

re-doing your action. We do not need such strict rules at the desktop. So before you actually enter your flight into the logbook, you first enter it into the draft, either by using this menu option, or even easier by pressing the push bottom Add to Draft.

3.4.2. Edit In Draft

After having entered all the flights of the day you take a quick look at the draft in the View Section at the bottom of the page and make sure that there are no obvious mistakes.
If there are, you just mark the line (press left mouse button) and select the menu option Edit in Draft – or much easier double click with the left mouse button on the flight, and look, the flight is now back into the columns, where you moments ago entered the data. Just move the cursor to the field you typed wrong, and re-type the data. When done, Add to Draft once again. There will be no trace of this correction, but the flight never actually entered the logbook, anyway. – Making a correction in the logbook and leaving a trace of this correction is quite another story. Read about this in section xxxxx.

3.5. Menu Line – Delete

You have six options:

1. Delete A/C Type
2. Delete Registration Number
3. Delete Crewmember
4. Delete My Description
5. Delete Route Flown
6. Delete from draft

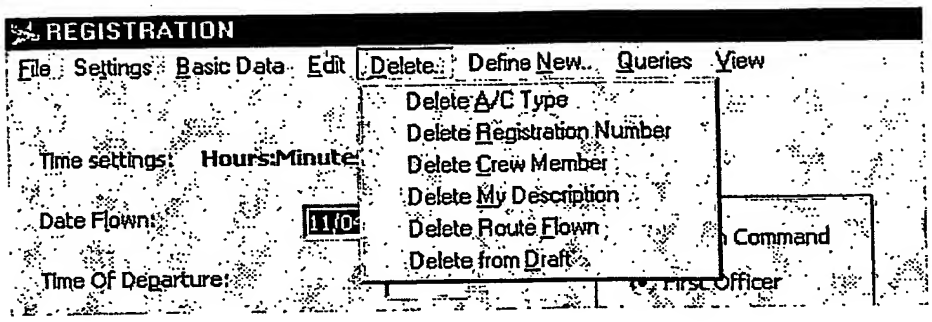


Figure 3.5. - Delete

3.5.1. Menu Line – Delete – A/C Type

If you wish to reduce the number of aircraft stored in your database, you can remove those that you do not expect to fly any more. This will have no effect on the flights already entered in the logbook.

3.5.2. Menu Line – Delete – Registration Number

The same can be said about this item. Remove it if you think its more a pain than an aid.

3.5.3. Menu Line – Delete – Crew Member

This guy – you remember? No, you don't even remember him – why should he still be in the database. He left the company a couple of years ago for a job in another airline. Should he ever regret, we can re-enter him at that time. Anyway, he'll be back as a first officer then.

3.5.4. Menu Line – Delete – My Description

Lucky you. You are done with paying for your flight time yourself (now you are receiving a decent salary, though, of course, not even in the neighborhood of what you are worth), but now is a good time to remove those special Cessna 172 Fun Flying Club. If ever you get back to real flying again, its just on a Cessna 172, and then you'll get paid for it. No reason to keep books on accountancy.

3.5.5. Menu Line – Delete – Route Flown

From next month you will be flying intercontinental. No reason to keep all these domestic routes. Delete them.

3.5.6. Menu Line – Delete – from Draft

Mark a flight in the draft at the bottom of the Main Screen. Select Delete From Draft. Or much easier: mark the flight and press the DELETE button on your keyboard.

3.6. Menu Line – Define New

You have three options:

1. Define New Registration
2. Define New Route
3. Define New Description

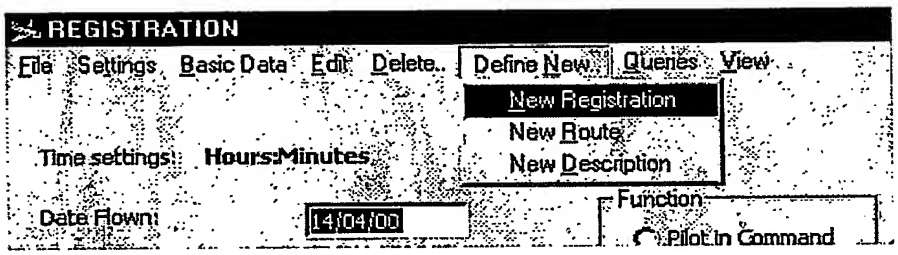


Figure 3.6. – Define New

3.6.1. Menu Line – Define – New Registration

This is one way to get into the registration form for aircraft. Before you enter into the logbook that you have flown N12345 from Miami to John F. Kennedy, the computer must be informed, that N12345 is a B737. If it not already knows it, it must also be informed that a B737 is a multi engine land aircraft powered by turbo jet engines and flown by a crew of two pilots.

3.6.2. Menu Line – Define – New Route

3.6.3. Menu Line – Define – My Description

3.7. Menu Line – Queries

Now we are getting to the more interesting part of our logbook. That's all we have been working for for years: training flight with stupid instructors, later training flights with even more stupid students, business flight with people that did not know the difference between a pilot and a porter, news paper flights to small country fields at night etc. Now, let's see how many hours we are at now, how many multi engine, how many instrument. And just for the fun of it, how many hours have I flown between that forgotten little village to another forgotten little village together with Gus, the brain dead co-pilot? But most important, do I finally qualify for that fine job they advertise about in the latest issue of Flight International? Let's see. In just a couple of minutes we'll know.

Select Queries on the Menu Line. You get two options:

1. Simple Statistic
2. Advanced Statistic

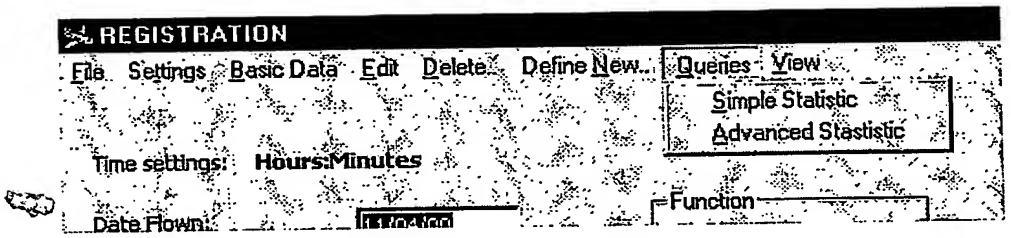


Figure 3.7. – Menu - Queries

3.7.1. – Menu – Queries – Simple Statistic

Do you have the feeling that you have see this form before. We hope you have. You should have. Because this is our Main Screen – almost, that is. At least it has a very similar appearance. The pilot business is a very diversified business. When we started on the project of making the world's best electronic logbook we tried to sit down and imagine all the situations and combination of situations that a pilot might face when he was to account for his flight in all the details required by law, but also by his own wish of saving some memorizing details about the flight in just a single line.

We made up the Main Screen which should satisfy all requirements. And with our own ambition in mind that you should be able to search for a flight in all the same ways that you store it, it came to us like a revelation: let the query screen look just like the Main Screen. It can never be simpler than that.

Every item you fill out on the screen means a limitation to the flights found. If you leave all the fields blank, the VIEW RESULT or the PRINT RESULT buttons will print the whole logbook.

You can limit the amount of flights by filling out the FROM DATE and/or the TO DATE, as you will get only the flights in the prescribed periode.

You can further limit the flights by selecting a certain crewmember. The flights shown will be only the flights where this crewmember was part of the crew.

In the same way you can get your multi engine time, your instrument time, your night time, your widebody time, your Fun Flying Club time, pilot-in-command time, cross country time, etc.

At the right panel you see the query that you – together with the program – have set up (if you should not know).

There are two windows at the bottom of the screen. The upper window gives you just what you were so anxious to see, the total times of all you can imagine: Total, VFR, IFR, single engine, multi engine, time day, time night, landings day, landings night, etc.

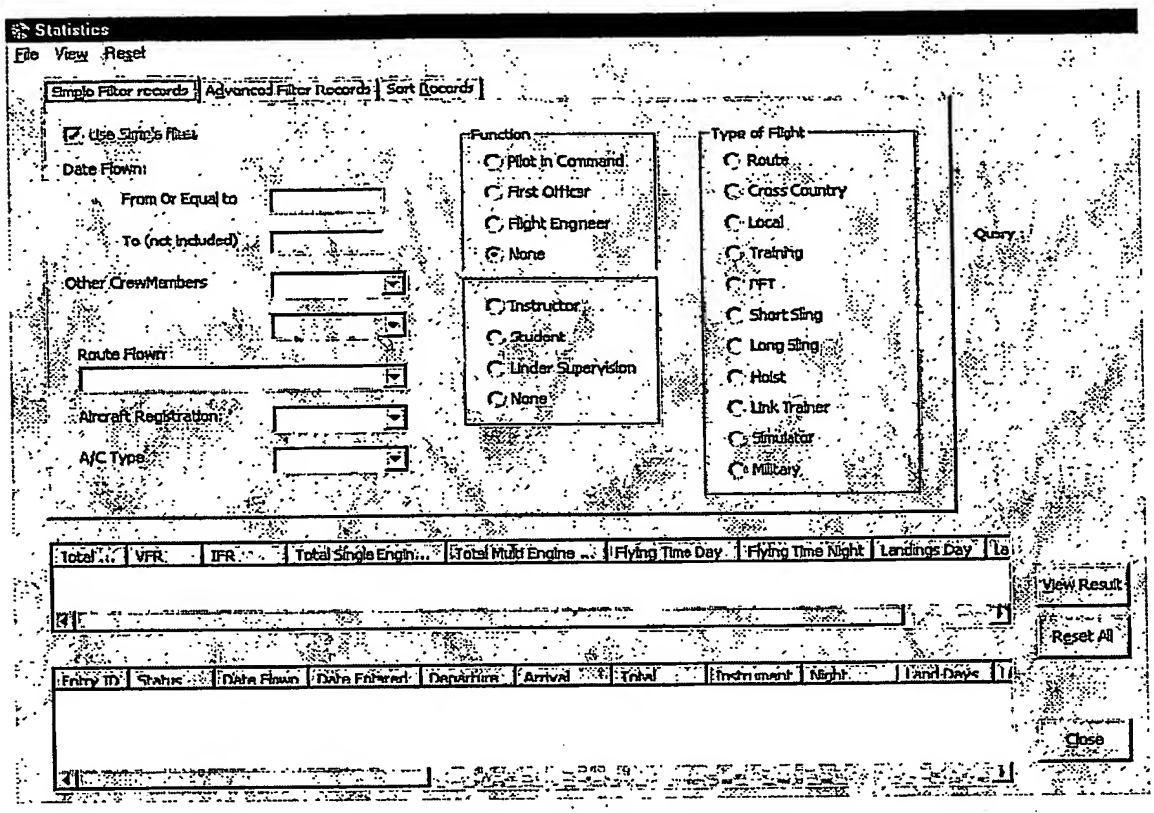


Figure 3.6.1. – Simple Statistics

The lower window lists all the flights found in this query. What do you want more? Pilots with a total of several hundred years of flying experience have formed the ideas for this program. Together we have not been able to imagine what else you might wish. But there was one thing we agreed upon: When first you see this program, you will be overwhelmed, but soon there will be things that even we didn't have the imagination to think you might wish. So help us get it even better – keep in contact!

Did we say Simple Statistics? Yes, very simple to use. But dare you say simple to the software people that created the code. If you dare, please do it when we are not there.

3.6.2. Menu – Queries – Advanced Statistics

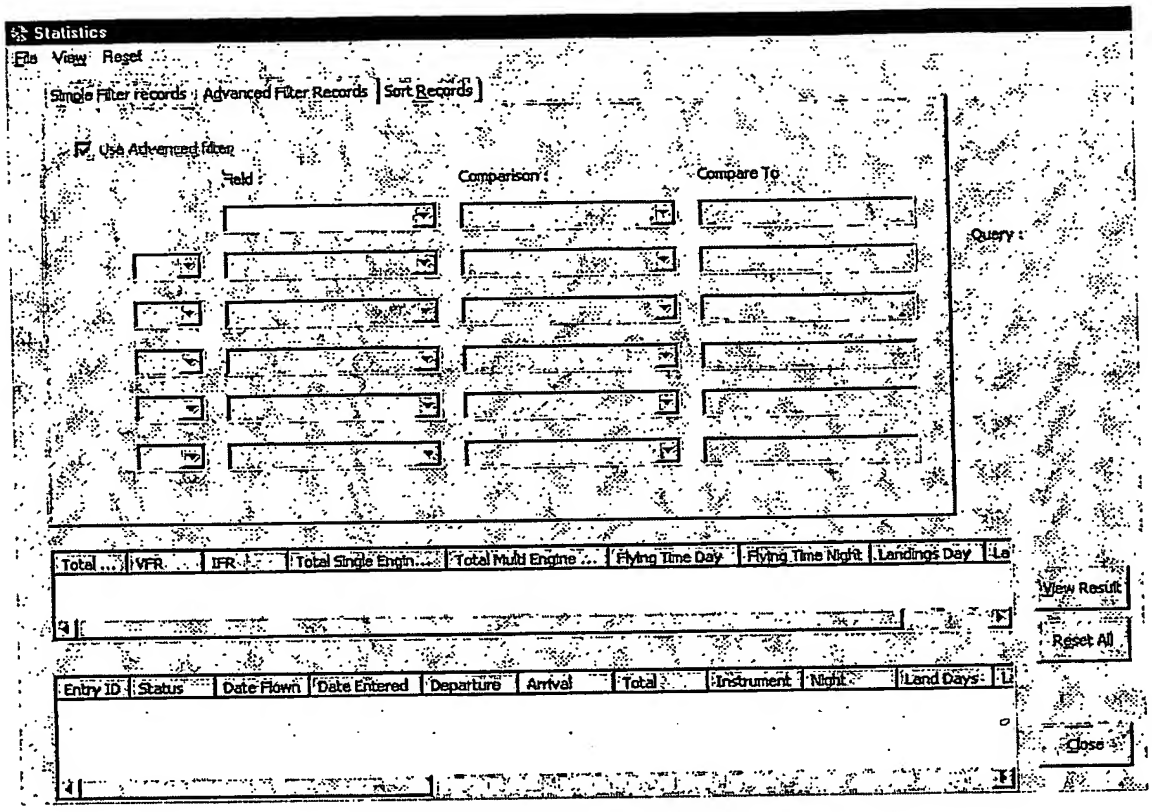


Figure 3.6.2. – Advanced Statistics

And just for the H... of it. Where there is a Simple Statistics there better be an Advanced Statistics as well. We cannot imagine what you would use that for, but you could find all the flights between A and B with a flight time of less than 1:30 or more than 1:45, if you think that would be interesting. Well, no matter how much we like the Simple Statistics screen, we have to admit that the Advanced Statistics screed allow you to be a little more specific. But if you need it is just another question. Have fun!

3.7. Menu Line – View

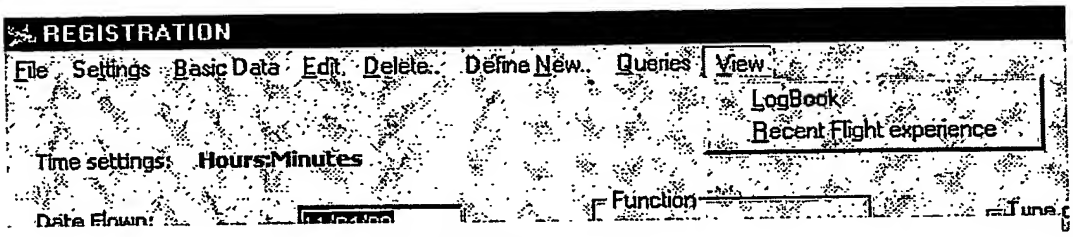


Figure 3.7. - View

Select View on the Menu Line, and you get two options:

1. LogBook
2. Recent Flight Experience

3.7.1. Menu Line – View – LogBook

This option lets you see the logbook just as it appears when printed out. Notice how much information each entry contains compared to the old fashioned paper logbooks. It's even less voluminous and more readable. Notice the gray marked entries. Those are deleted entries. Of course they don't count in the total, but they are there for anybody to see what once was entered and then deleted.

Also notice that each entry is marked with not only the date of the flight, but also with the date on which the flight was entered. So when you start on this electronic logbook just take an hour a day to enter the previous 30 years of flights after you have entered today's flights. It will be clear to everybody why there is a lap of 30 years between the date of flight and the date of entry. And by the way, don't give up on entering those six old fashioned logbooks. It looks like a tremendous piece of work, but believe me, its not that bad at all. After all, one of the purposes

with this program was to make entering data easy. Go on to the next chapter of the manual and realize how easy it is, now and forever.

Every time you have filled out a page in the logbook ask for a printout (pushbutton PRINT). You will be transferred to Windows' print menu that you know so well. Select the latest page to be printed out – don't print the whole logbook every time, that will cost you paper (you know, the rain forests of the world and all this).

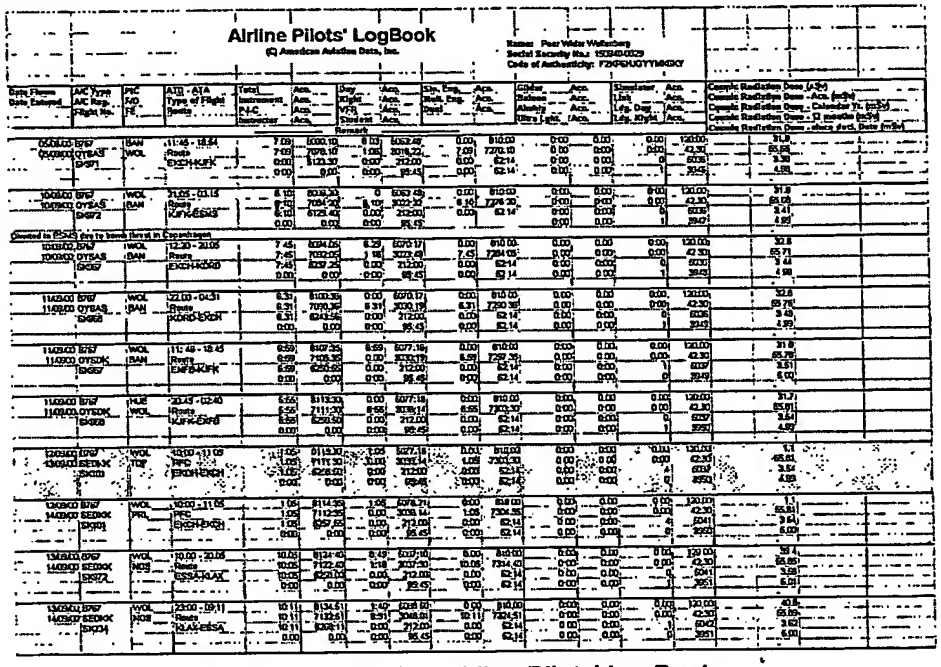
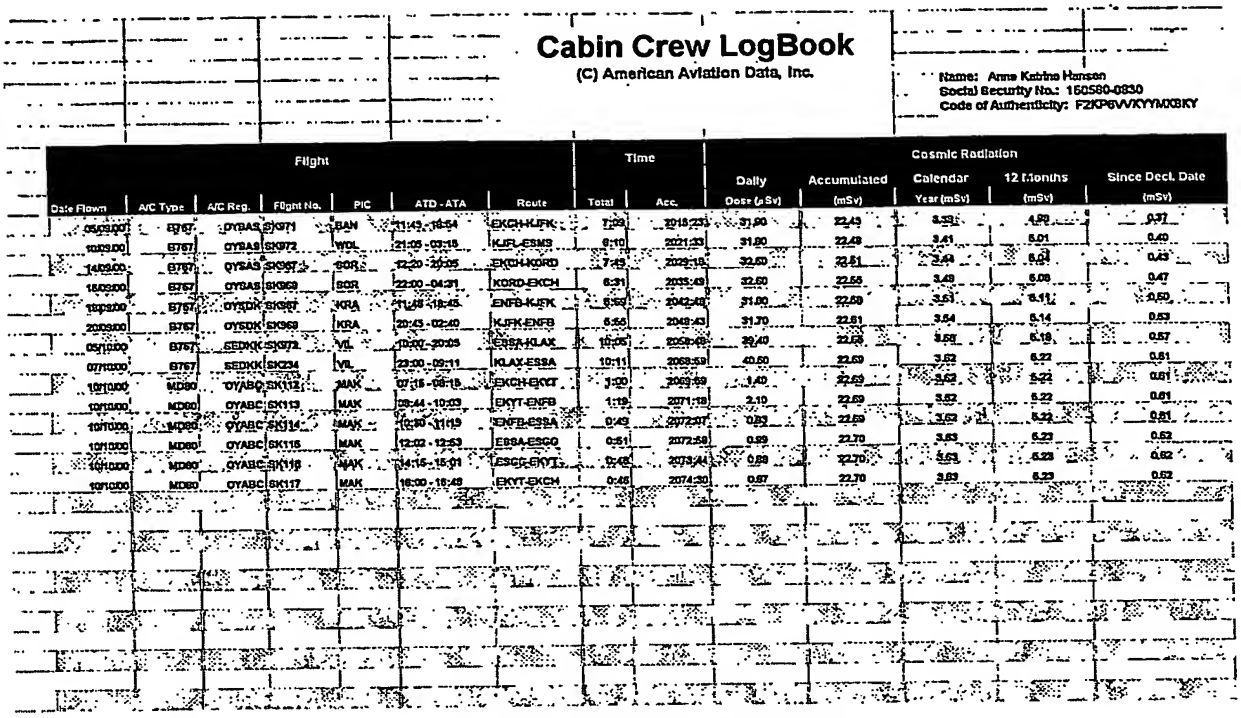


Figure 3.7.1. – Airline Pilots' LogBook

If you are a pilot your logbook will look like this (remember the pilot logbook is required to be somewhat more detailed that the cabin attendant logbook?):

If you are not a pilot, i.e. you are a cabin attendant or a passenger, your logbook will look a little more simple, as the radiation doses are the important thing here (does it bother you as a passenger that the header says CABIN CREW LOGBOOK? Don't, you will get your own with the header PASSENGER LOGBOOK, and of course with your own name – this is just an example):



Cabin Crew LogBook

(C) American Aviation Data, Inc.

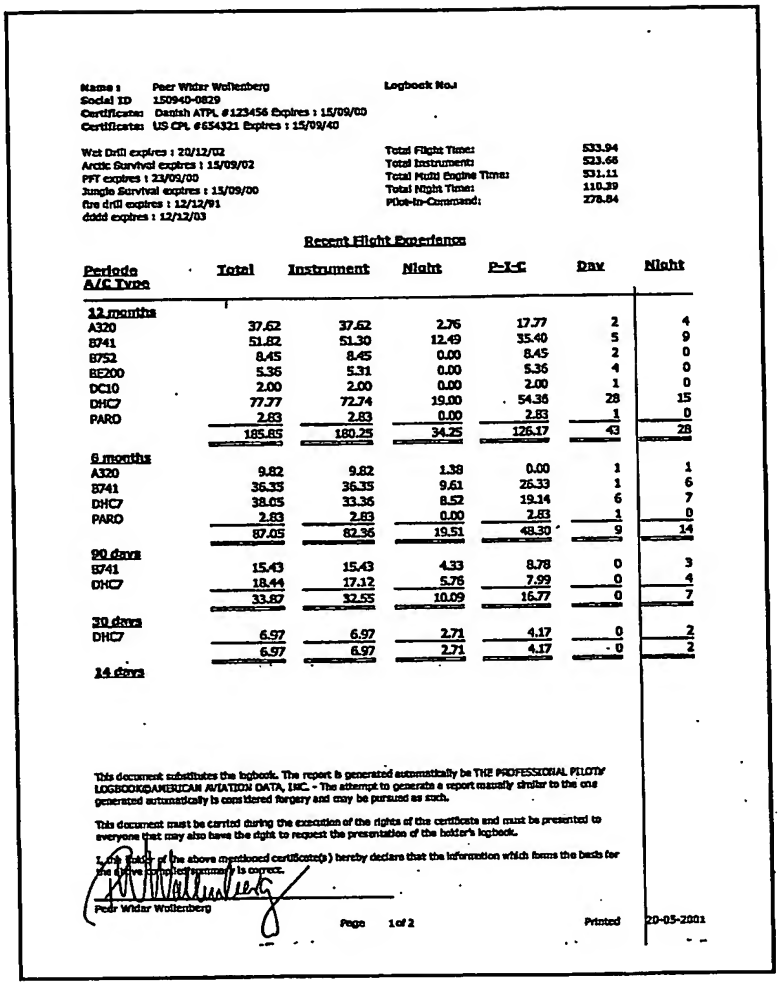
Name: Anne Katrine Hansen
Social Security No.: 160580-0830
Code of Authenticity: F2KP6VVKYYM0BKY

Flight							Time		Cosmic Radiation				
									Daily	Accumulated	Calendar	12 Months	Since Dec. Date
Date Flown	A/C Type	A/C Reg.	Flight No.	PIC	ATD - ATA	Route	Total	Acc.	Dose (µSv)	(mSv)	Year (mSv)	(mSv)	(mSv)
05/0900	B767	OYBAS	SK971	DAN	11:43 - 18:54	EKCH-KJFK	7:29	2018:23	31.90	22.43	3.33	4.99	0.37
10/0900	B767	OYSAS	SK972	WDL	21:05 - 03:15	KJFK-ESMS	6:10	2021:33	31.80	22.49	3.41	5.01	0.40
14/0900	B767	OYSAS	SK967	SOR	12:20 - 20:05	EKCH-KORD	7:45	2029:18	32.60	22.61	3.49	5.07	0.43
18/0900	B767	OYSAS	SK968	SOR	22:00 - 04:31	KORD-EKCH	6:31	2035:49	32.60	22.65	3.48	5.08	0.47
19/0900	B767	OYSDK	SK967	KRA	11:58 - 18:45	ENFB-KJFK	6:50	2042:43	31.90	22.69	3.51	5.11	0.50
23/0900	B767	OYSDK	SK968	KRA	20:43 - 02:40	KJFK-ENFB	6:56	2049:43	31.70	22.81	3.54	5.14	0.53
05/1000	B767	SEDKK	SK972	VIL	19:00 - 20:05	ESSA-KLAX	10:05	2059:48	39.40	22.69	3.60	5.19	0.57
07/1000	B767	SEDKK	SK234	VIL	23:00 - 09:11	KLAX-ESSA	10:11	2068:59	40.60	22.69	3.62	5.22	0.61
10/1000	MD80	OYABC	SK112	MAK	07:15 - 09:15	EKCH-EKYT	3:00	2069:59	3.40	22.69	3.62	5.22	0.61
10/1000	MD80	OYABC	SK113	MAK	09:44 - 10:03	EKYT-ENFB	1:19	2071:18	3.10	22.69	3.62	5.22	0.61
10/1000	MD80	OYABC	SK114	MAK	10:30 - 11:19	ENFB-ESSA	0:49	2072:07	0.93	22.69	3.62	5.22	0.61
10/1000	MD80	OYABC	SK115	MAK	12:02 - 13:53	ESSA-ESGG	0:51	2072:58	0.99	22.70	3.63	5.23	0.62
10/1000	MD80	OYABC	SK116	MAK	14:15 - 15:01	ESGG-EKYT	0:46	2073:44	0.88	22.70	3.63	5.23	0.62
10/1000	MD80	OYABC	SK117	MAK	16:00 - 16:46	EKYT-EKCH	0:46	2074:30	0.87	22.70	3.63	5.23	0.62

Figure 3.7.2. – Cabin Crew LogBook

GLOBALOG®
The Electronic Air Crew LogBook®

3.7.2. Menu Line – View – Recent Flight Experience



Name : Peer Widar Wollenberg
Social ID 150940-0829
Certificates: Danish ATPL #123456 Expires : 15/09/00
Certificates: US CPL #654321 Expires : 15/09/40

Logbook No.:

Wet Drill expires : 20/12/02
Arctic Survival expires : 15/09/02
PFT expires : 23/09/00
Jungle Survival expires : 15/09/00
fire drill expires : 12/12/91
dddd expires : 12/12/03

Total Flight Time:	533.94
Total Instrument:	523.66
Total Multi Engine Time:	531.11
Total Night Time:	110.39
Pilot-in-Command:	278.84

Recent Flight Experience

Periode A/C Type	Total	Instrument	Night	P-I-C	Day	Night
12 months						
A320	37.62	37.62	2.76	17.77	2	4
B741	51.82	51.30	12.49	35.40	5	9
B752	8.45	8.45	0.00	8.45	2	0
BE200	5.35	5.31	0.00	5.35	4	0
DC10	2.00	2.00	0.00	2.00	1	0
DHC7	77.77	72.74	19.00	54.36	28	15
PARO	2.83	2.83	0.00	2.83	1	0
	185.85	180.25	34.25	126.17	43	28
6 months						
A320	9.82	9.82	1.38	0.00	1	1
B741	36.35	36.35	9.61	26.33	1	6
DHC7	38.05	33.36	8.52	19.14	6	7
PARO	2.83	2.83	0.00	2.83	1	0
	87.05	82.36	19.51	48.30	9	14
90 days						
B741	15.43	15.43	4.33	8.78	0	3
DHC7	18.44	17.12	5.76	7.99	0	4
	33.87	32.55	10.09	16.77	0	7
30 days						
DHC7	6.97	6.97	2.71	4.17	0	2
	6.97	6.97	2.71	4.17	0	2
14 days						

This document substitutes the logbook. The report is generated automatically be THE PROFESSIONAL PILOTS' LOGBOOK©AMERICAN AVIATION DATA, INC. - The attempt to generate a report manually similar to the one generated automatically is considered forgery and may be pursued as such.

This document must be carried during the execution of the rights of the certificate and must be presented to everyone that may also have the right to request the presentation of the holder's logbook.

I, the holder of the above mentioned certificate(s) hereby declare that the information which forms the basis for the above compiled summary is correct.

Peer Widar Wollenberg

Page 1 of 2

Printed 20-05-2001

Figure 3.7.3. – Recent Flight Experience

You will love this, especially if you think your flight bag is heavy enough with three Jeppesen route manuals, maps, aircraft manuals, FAA/CAA Rules and Regulations, toilette bag, and all that experience has taught you to take along. Everything to confirm that you are current on just one piece of paper (well, maybe two if you have flown many different A/C Types during the past 12 months), just

to put into your inner pocket. Should anyone ask, just show them this printout for documentation. No need to bring another few pounds of logbooks. – And by the way, you need not even go via the menu line to get here. The program knows what you want even before you mentioned it. When you are done with your entering data, press the push button, and the program asks you if not you would like a printout of your Recent Flight Experience. Just press Return, or use the option of saying "Thanks, but no".

This piece of paper is to be considered an official document. Not much computer skill is required to forge a similar document with a false amount of flying time. However, such an action is a crime. Reading and copying the paragraph below the table of flight time makes this criminal action one of aggravating circumstances as it will be clearly intentional.

Chapter 4 Quick'n Easy Data In

There are three ways to enter data

If you are a crew member and employed with an airline
that subscribes to GLOBALOG® on behalf of its crew members, the data input will happen automatically. Depending on the agreement with the airline it may be necessary that you approve the flights in the draft to be registered in the database. Other airlines may wish to do the full registering centrally.

If you are an individual crew member (pilot or cabin attendant) or a passenger and use our GPS version
the only thing you have to do is to start and end the program. Every minute after you have started it the program will register your position and altitude. When it first registers that your position has changed, it will note the time as your Off-Block-Time. When your altitude has changed it will note the time as your Airborne-Time. When you stop the program it will note the position as the gate position and the time when you reached this position as your On-Block-Time. It will note the time when you reached the altitude at the gate as your On-Ground-Time. Therefore it is important that you do not start until you are seated, and that you stop the program before leaving the seat. As the program knows the position of all airports in the world the registering of departure- and destination airports is automatic. – When you stop the program your flight file will automatically be transferred to the GLOBALOG® servers, assuming that you have Internet access. All that is left to your responsibility is starting and stopping the program and making sure that you have the sufficient battery power before starting on the flight.

If you do not use the GPS version

you need to enter the data manually. If you are a pilot there are more data to enter than if you are a cabin attendant or a passenger. But this is taken care of by the program – just follow the instructions on the screen. Remember that all times must be in UTC, what earlier was known as GMT (Greenwich Mean Time), which is the time in London (if not during Daylight Saving Time – if so, add one hour). – It is important that you remember that this input is in UTC, as the radiation data are stored in UTC times.

Chapter 5 Quick'n Easy Data Out

Getting data out is as easy as putting data in.

The full logbook: Go to the menu line: **View – LogBook**. The logbook including the flight you just entered will show. If you want you can now choose to print all or part of it. If you want a constantly updated printed logbook just follow up after each flight and ask for the last page.

Selected flights: Go to the menu line: **Queries – Simple Statistics.** Choose the criteria for the flights you wish to see. Press the button **View Result** and the selected flights appear on the screen as a logbook containing only those flight fulfilling the criteria applied.

From here you can print out these flights in the usual logbook format.

Recent Flight Experience: When meeting a CAA inspector asking for documentation of your recent flight experience you would earlier have shown him your logbook. Now you are able to document your experience directly from the **GLOBALOG®** files on the Internet, assuming, of course, that you carry a computer with an Internet connection yourself, as you cannot expect that the inspector brings one himself. If you are not 100% sure that you can get access to the Internet yourself, then better be on the safe side and bring a copy of **The Recent Flight Experience Printout**. Actually, why don't you make it a habit to take this printout every time you have finished you data input? Sign the printout and put it into your pocket, and you are ready for your next flight.

Chapter 6
Error Messages

So far there has been no need to explain any error messages.

Chapter 7
Keep in Contact

As already mentioned we believe there is nothing in the world like **GLOBALOG®** – or even close to it. But we are also aware that among our many users of **GLOBALOG®**, new ideas, perhaps even very bright ideas, will be caught from time to time. It is important for us that such new ideas are implemented as soon as possible. Therefore, please contact us the quickest way there is – via e-mail. Perhaps you would think telephone is after all the quickest way. Actually it is not. If we get the idea via telephone the receiver is to formulate your idea on paper, and who can do this better than the person who caught the idea? So write to us via our home page: **Contact Us**

As important is it that you leave your e-mail address. There may be many reasons that we would need to contact you:

One reason could be that you have reached a certain level of cosmic radiation. In this case it is part of what you pay for to receive from us a message with a proper warning.

So keep in mind that you keep your e-mail addresses updated. And - just in case – your telephone number and snail mail address.

But most important: keep reading the news on our home page. We shall keep you updated on all matters of importance to aviation, including new findings in connection with cosmic radiation and health. And of course of changes in the functionality of **GLOBALOG®**.

Also, there will be links to other sites of interest for pilots, cabin attendants, and airline passengers.

Annex 2

GLOBALOG®

THE ELECTRONIC AIR CREW LOGBOOK©

Technical report
concerning
the development of formulas and technique
for the calculation of
cosmic radiation doses
and
night flying time

Introduction

GLOBALOG – the Electronic Crew Logbook is a registration system, of which the object is

1. to register the pilots' flying time according to the rules that are imposed on pilots throughout the world according to partly European and partly American rules
2. to register all crew members' exposure to cosmic radiation according to the rules that are laid down in the National Board of Health in Denmark (Sundhedsstyrelsen) regulation No. 823 of 31 October 1997 (Regulation on dose limits for ionizing radiation). - The provisions of the regulation are imposed to all airline companies within the Nordic countries by AIC B (Auronautical Information Circulars, series B) No. 07/02 of 28 January 2002 (Control of the Exposure to Cosmic Radiation of Air Crew in the Nordic Countries) and originates in EU Directive 96/29/Euratom pf 13 May 1996. Similar provisions are consequently applicable for the aviation in the remaining European countries.

Re. 1. In consideration of flight security it is necessary that demands are made concerning the pilots' routine level, partly in consideration of the daily flying, partly in consideration of the general level of experience before the commencement of further education and issuance of advanced certificates. Therefore, the pilot must be able on request to prove to representatives of the civil aviation authorities that the continuous level of experience in the form of more specific flying time is in accordance with the minimum requirements indicated in the regulations issued by the civil aviation authorities. This is done by the presentation of the logbook, which is brought along on each flight and which is to be kept up to date after each flight.

Furthermore, the logbook is used as a documentation for the required level of experience when applying for an employment in another company. Due to the pronounced globalisation within precisely this line of business, it has been necessary to a certain extent to standardize the requirements on which details which are to enter into the logbook. The two predominant standards are set by Federal Aviation Administration (FAA - the American aviation authorities) and Joint Aviation Authorities (JAA - the common European aviation authorities), respectively. The two standards are to are very much alike, but where the European rules state that each and every flight must be entered, a pilot operating under the American rules only needs to enter the flying time that he/she wishes to use as formal documentation. Under any circumstances, GLOBALOG meets the requirements of the two authorities and can thus be used by pilots throughout the world.

Consequently, GLOBALOG is, in its original form, an electronic logbook for pilots. The logbook is developed on the basis of a professional requirement and is elaborated in such a way that it not only satisfies the pilots' requirements, but it also - as the only logbook on the market - meets the demands that the authorities must make concerning a document of this kind. The logbook, which is developed to

not only individual pilots, but also to aviation enterprises, makes it possible to enter flying time data for both pilots and aircrafts already at the source. Firstly, this results in error possibilities and secondly, it rationalizes the organization of work for the companies' operational department with a saving of working hours as a direct result.

GLOBALOG stores the pilots' and the companies' flying time data on central servers. This gives the security against manipulation of data and unauthorized interventions necessary in order for the pilots to entrust there precious data to others than themselves, and which are necessary in order for the authorities to approve of the system at all. - The central storage of data also makes it possible for the authorities to control a pilot's or an aircraft's flying time data directly from the office, either as part of an investigation caused by a damage or as part of the police solving a criminal incident, in which a pilot or an aircraft has been involved. The last-mentioned has turned out to be of more immediate importance after September 11, 2001, and it is of course in the interest of everybody that the authorities are given the best possibilities to the solving and the prevention of incidents. - It also makes it redundant for the pilot to bring along a copy of his/her logbook on every flight, as a possible control can be carried out with a portable computer.

GLOBALOG also functions as a job database for the pilots wishing to participate in it. On the basis of the criteria and qualification requirements that a given company would impose to potential candidates it is possible - anonymously, via GLOBALOG - to send an application form with an invitation to apply to exactly those pilots, who meet the requirements for the available position.

As mentioned, the data are stored on central servers with accession from the internet. This means that in order to obtain access to ones own data, the individual pilot must, via his/her alloted password, go to our homepage from where he/she can proceed to his/her logbook. However, he/she also gets a possibility of linking on to a specific page, where different advertisers have the possibility of offering products of special interest for pilots.

In consideration of the flight safety it has been important for the authorities to ensure that each pilot cannot manipulate with his flying time. This is among other things ensured in that deletions in the flights cannot be made once the flight is entered. However, the flights can be made "invalid" in the way that they do not enter into the summing up, but still appear from the logbook in a way that clearly shows that the flight is a "deleted" flight. In the present system (with handwritten logbooks), it is possible to cheat, if anyone should want to do so, by keeping one or several parallel sets of logbooks. This possibility is excluded with the GLOBALOG system, as the system will refuse to create a logbook with a combination of name and personal identification number already existing in the system.

As already mentioned, the internet will be medium which will be used for the transfer of data. It will therefore be possible to type in data directly from a PC, a PDA (hand held computer), a WAP telephone as well as an ordinary mobile phone. In particular with a view to the interest which presumably - with reference to Re. 2 - will exist regarding the registration of time for not only pilots and flight crew, but also for "frequent flyers" and especially pregant women, we have developed a concept, where the position and altitude are registered automatically each minute on a PDA (hand held computer) which is attached to a GPS module. The transfer of data will take place automatically after the end of the flight via the internet, and a few seconds later, the person in question - crew member or passenger - will be able to see all the details - including radiation data as described in Re. 2 - in his/her logbook, be able to search in every way or print out part of or the whole of the logbook. It is emphasized that the transfer of data can take place as fast as possible after a terminated flight - already before the pilots leave the cockpit, so that among others the technical personnel, already when leaving the hangar to receive the aircraft, can bring along the necessary tools and spare parts. We have emphasized that the entering of data shall be more expedite than it is in the present system, and that the reading of data will be easier for all involved parties.

One of the details which is required to be registered in the logbook is information on the part of the flight that has taken place at night (night flying time). In individually kept logbooks (paper and ink) this requirement is based on an estimate. as "night" is defined as the period of time starting when the centre of the sun in a descending direction passes a point lying 6 arc degrees under the horizon, until the centre of the sun in an ascending direction again passes a point, which similarly lies 6 arc degrees under the horizon. It is therefore possible that a part of the flight in the flying altitude takes place during full daylight, while it is night at sea level. According to the definition the time of this part of the flight is also to be registered as night time. - For airline companies which have had the permission from the authorities to register the flying time on behalf of the pilots, this requirement has been neglected, which is why the aviation authorities' approval of this kind of logbook keeping must be said to be comprised by a great deal of tolerance. - As it will appear later on in this description, GLOBALOG divides the flight into small parts corresponding to 1 minutes flight with a calculation of the position and the height in each of these points. In addition to the calculation of a value of the cosmic radiation in each of these points minute by minute - as described below - sunset and sunrise is also calculated in each of these points. And depending on whether the passing moment for the point in question lies between sunrise and sunset, or it lies between sunset and sunrise, the minute flown (since the passing of the previous "minute point") is indicated as "Day flying time" and "Night flying time", respectively. At the end of the flight the two categories are summed up and indicated in the respective sections. - For airline companies the transfer will automatically take place after the flight has been provided with an "On-Block-Time" in the company's computer, which is a clear declaration stating that the concerned flight is now terminated. The transfer takes place with a 128 bit encryption, and after

receipt and decryption, the data connected with the flight are calculated, distributed, stored and administered.

Re. 2. The original electronic logbook for pilots is, on the occasion of the above mentioned law requirement, extended to also calculate and store the doses of cosmic radiation that the aircraft with its content of crew and passengers are subject to. In addition to this, the GLOBALOG concept administers the calculated and stored radiation data so that the attention of both the crew members and the passengers via e-mail is being drawn to it, in case they exceed a radiation limit value recommended by the health authorities. As for the crew members, the company will also be informed.

The reason for the law requirement as cited in point 2 above is that there is an indication of a highly justified suspicion that several frequencies of cancer with the flying personnel is due to the cosmic radiation, which is an accumulation of partly the radiation from space (the galactic radiation) and the periodically occuring high-energy projections from the sun. Where the constant projection from the sun creates a protecting layer around the Earth, the periodically occuring projections (the so-called Solar Storms) are so powerful that they break through the protecting shield and cause a radiation, which regularly reaches a power of 10 - 20 times the galactic radiation. The cosmic radiation consists of (positively loaded) protons for 90% of the total, which originate from "the big bang" 10-20 billion years ago, which protons at the collision with the atmosphere to some extent, due to the electric charge, deflect with the Earth's magnetic field, while part of the particles continue down through the atmosphere. As the protons together with the neutrons constitute the all-important part of the weight of the atom, it is a large amount of energy which is present in these particles, which therefore, when colliding with the molecules of the Earth's atmosphere break these up to new constituents of atoms, and thereby new protons and neutrons, which each continue this chain reaction. The process is called ionization and the radiation connected with it is characterised as ionizing radiation. Radiation can thus by using common language be called a current of particles. These particles hit the the atmosphere of the Earth at a speed of 800 - 1200 kilometres per second, and as the particle current as mentioned above consists of the heavy part of the atoms, each particle is immensely loaded with energy. - If such a heavy projectile hits a human cell, the cell might either die, which is not a great disaster, as it will then be substituted by a new cell with the same properties. It is worse if the cell does not die, but in "self-defence" divide themselves and create a new cell with a built-in property of being able immediately to divide up again, as this can be the beginning of an untrammelled cell division. This is what we ordinarily call cancer. Such a damage is called a stochastic damage, as the effect does not show until 5-30 years after the irradiation.

Or the particle can hit a DNA molecule which as it is known consists of two strings. If only one of the strings is hit and teared apart, the chances for the DNA molecule to grow correctly together again are good and in that case there will be no damage done. But if on the other hand both the strings of the

DNA are teared apart, there is a predominant risk that the DNA will grow together incorrectly and thereby create completely new genetic properties (provided the cell which has been hit is a gamete). Although it is inter alia through genetic alterations (mutations) that the animal and plant life of today has developed from the simple creatures, which were the first to populate the Earth, the main rule is that a damaged DNA will result in unfavourable characteristics compared to the individual who was subject to the radiation.

Similarly, the chromosomes can be damaged, whereby new - and probably unfavourable - characteristics will also be created. In both cases the issue is about genetic damages, which are passed on the progeny, either as a yielding or as a dominating characteristic.

Both the stochastic and the genetic damages are characterised in that there is no limit beyond which it can be expected that the damage would not occur. The risk will be there even at small doses (e.g. the naturally occurring), but increase linearly with progressive doses.

Especially for an embryo/foetus, which undergoes a constant development, the radiation is critical. Therefore, a particularly low limit for what pregnant women are to be exposed to has been set. An exceeding hereof will increase the risk of the child being born with mental or physical damages, including leukaemia.

Due to the protection of the atmosphere, the radiation will increase with the altitude and, roughly stated, be doubled for each 6500 feet increase of the altitude. - And due to the protection of the magnetic field the radiation will be most weak over equator, while it will be strongest over the magnetic poles. - And finally - due to the protecting effect of the sun - the power will vary with the course of the solar year (= 11 Earth years).

Among the researchers, there is a great divergence in the evaluation of the risks as to questions of health. For instance, a study shows that among pilots there was quadruplication of occurrences of leukaemia, a doubling of occurrences of brain tumors and a sextupling of occurrences of skin cancer, while another study shows that among female crew members there was an increase of 30% of occurrences of cancer of the breast - all the occurrences compared to general population. Others are of the opinion that these figures are highly exaggerated. The problem can possibly be attributed to the fact that there has not previously been conducted any systematic calculation and filing of the values of these groups exposure to radiation. - Apart from the concept described in the patent application aiming at facilitate the airline companies' calculation, filing and administration of the crews' exposure to cosmic radiation, it would be a side benefit of considerable dimensions if these data were to be offered to the cancer research without costs therefore.

By the registration of cosmic radiation it would be fair that each and every dose could be attributed to a specific flight, as it would also be fair that each crew member continuously could follow each dose and the accumulation of the doses. By using the pilot logbook and enter some additional columns, the problem would be solved for the pilots. - For the flight crew, however, there is no requirement concerning entering of flight time. But as it would still be reasonable to continuously follow one's radiation and attribute the single doses to specific flights, GLOBALOG has introduced a Flight crew Logbook. This logbook is not substantially different from the pilots' logbook, but merely contains fewer details on each flight, but still enough to unambiguously attribute each dose to a specific flight. The same limited edition of the logbook can also be offered to passengers, presuming that there would be a certain interest for this among especially pregnant women and frequent flyers. - Until the cancer research (inter alia by means of our data) is capable of make more specific declarations on the risks of cosmic radiation, it is to be recommended that also others, in particular children and young people, who are still in the middle of a physical development, keep such a cosmic account.

The mentioned AIC B 07/02 mentions, among others, a programme called CARI-6 (footnote 2), which has shown - "...within acceptable uncertainty limits..." - to indicate radiation values in accordance with registered measurings. The programme is made available for the aviation by FAA (the American aviation authorities), and even though the mentioned footnote mentions that an agreement has not yet been reached on any specific registration procedure, it is the CARI-6 programme (or a similar European programme EPCARD-3.1) that is used by the aviation authorities trying to meet the registration requirement.

CARI-6 is developed at the FAA Civil Medical Institute and calculates the effective dose of galactic cosmic radiation received by an individual flying between two airports via a great circular arc. The programme takes altitude changes and geographic positions into consideration during the flight. Apart from the altitude, the position and the flying time, the so-called heliocentric potential is applied in the calculations, which is published from the FAA each month as an average of the heliocentric potential for each of the days of the month. - A list of these average heliocentric potentials are available back from January 1958.

The CARI-6 programme is not difficult to understand, but on the other hand, it is quite unhandy and completely unsuitable for the calculation of the great number of flights performed daily by a large airline company, which is also why it has been reasonable to a certain extent to let the airline companies perform their radiation accounts in the way that it is made, even though the result is said to be completely unsuitable for the purpose, if the purpose is to protect the specific individual, as it is indicated in the mentioned AIC. Therefore, I see the law requirement with the "superficial" execution as a start of something, which after a period of development and adaptation to the practical conditions (and maybe an influence from the crew organizations), will lead to a result, which not only has the

purpose of protecting the exposed, but also to provide the research with as precise basic data as possible.

However, the CARI-6 programme contains functions which are not only attached to a single flight, but which are also used generally. The fact is that the programme can calculate the radiation (measured in microSievert per hour) at a specific position at a specific altitude and under a specific heliocentric potential. - A supplement to the programme calculates the corresponding heliocentric potential on the basis of a neutron counting from a particular observatory (The Apatity on the Kola peninsula), and as this observatory continuously indicates the number of impacts per 10 seconds, it is possible to calculate the radiation measured in microSievert per hour in a specific point at a specific altitude, exclusively by means of the functions in the CARI-6 programme, which, as mentioned above in the footnote 2 of the AIC, is emphasized as an example of a "suitable computer programme". - My task has consequently been to use the elements of the CARI-6 programme to create a database constituting data already approved, because they originate from an approved programme. The conditions are consequently that the CARI-6 calculations are correct, and what is to be validated are my functions for the conversion of Impacts per Second to a Heliocentric Potential and the conversion of data calculated on the basis of a Heliocentric Potential of 1000 MegaVolt for data of other values of the Heliocentric Potential.

This validation is performed by the Danish Institute of Space Research, which has approved the technique described below and the formulas indicated here. With this we have a tool which can calculate, with great precision, the exact dose that a crew member has been exposed to at a specific position in a specific altitude in exactly the specific minute when the person was in this position and altitude. This means that great fluctuations in the radiation activity will not hide in the average of a whole month. A month consists of almost 45.000 minutes and it is clear that a great burst of some few hours duration will only be considered as a weak "boss" on the curve, which is why the persons, which were exposed at exactly this moment, are only credited with a fraction of the radiation that they were actually exposed to. These fluctuations can actually be of such an order that a pregnant crew member on a single trip from Copenhagen to Los Angeles can obtain 1 mSv - the limit value for pregnant people, but as she is only credited with the normal (or average) dose of approximately 0.07 mSv, she also risks to obtain the double dose before her account shows 1.00 mSv.

The structure of the calculation of radiation in GLOBALOG. The core of the programme is a an extensive database, which in reality constitutes a 3-dimensional network around the earth with a data set for every crossing of a degree of longitude and a degree of latitude in 51 levels (from 0' to 50.000') - a total of 3.360.084 points. Each data set comprises three posts: SearchData, MicroSlevertPerHour and Coefficient.

SearchData Starting from a specific geographic position and altitude, a search string consisting of three parameters is created.

Example: 31 degrees North, 117 degrees East, 41000 feet will become N31E11741000

MicroSievertPerHour. The radiation at the specific point measured in microSievert per hour calculated by CARI-6 with a heliocentric potential of 1000 MV for each of the 3.360.084 points.

Coefficient. The coefficient between the radiation in the point in question and the radiation in the reference point. For each flying altitude the reference point is 68 degrees North, 034 degrees East, which is the position of the observatory that provides the measurements at the basis of the calculations. - This consequently means that the Coefficient=1.000 at SearchData=N68E034**000, where ** is the altitude (the altitude is indicated in feet above sea level).

Conversion of MinuteData (Impacts per 10 Seconds) to Heliocentric Potential As the neutron countings enter from the Apatity observatory, they are stored in the time database, from where they are looked out when the flight is to be calculated after its termination. The search string in the time database is the time (dd.mm.yyyy hh:mm) for the passage of the flight in the position in question, and in the position database, the search string comprises, as mentioned, the position and the altitude that the flight was passing at the moment in question - a specific number of minutes after departure or before landing (all time specifications are in UTC - Coordinated Universal Time (formerly known as GMT - Greenwich Mean Time)). When a data set (time and neutron figure) is found from the database, it will be necessary to convert the neutron figure to radiation power (microSievert per hour).

With the object of finding the connection between Imp's per Second and the heliocentric potential, 21 conversions from Imp's per Second to MV (Heliocentric Potential) were performed by means of an assisting programme to the CARI-6, the MV-finder (also supplied by the FAA). The results appear from Table 1.

Imp's per 10 Seconds	Heliocentric Potential (MV)
1748.63	0
1604.50	100
1514.50	200
1440.00	300
1377.50	400
1323.80	500
1276.30	500
1234.50	700
1197.00	800
1163.10	900
1137.90	1000
1110.00	1100
1084.10	1200
1060.20	1300
1038.10	1400
1017.50	1500
998.20	1600
980.10	1700
963.00	1800
946.90	1900
933.00	2000

Table 1

By means of CARI-6 this table was extended with an additional column, viz. for the calculation of the radiation power in the reference point in each of the 51 altitudes (Table 2 shows the results for 50.000 feet):

Imp's per 10 Seconds	Heliocentric Potential (MV)	Radiation µSv per Hour 68NO34E 50000 ft. CARI-6
1718.63	0	24.94
1604.50	100	21.73
1514.50	200	18.52
1440.00	300	16.77
1377.50	400	15.01
1323.80	500	13.88
1276.30	600	12.74
1234.50	700	11.85
1197.00	800	11.15
1163.10	900	10.57
1137.90	1000	9.99
1110.00	1100	9.53
1084.10	1200	9.08
1060.20	1300	8.71
1038.10	1400	8.35
1017.50	1500	8.06
998.20	1600	7.76
980.10	1700	7.52
963.00	1800	7.28
946.90	1900	7.07
933.00	2000	6.87

Table 2

It turned out that the radiation power can be calculated as a result of the function

$$F(X) = a*X^2 + b*X + c$$

with Imp's per Second as the independent variable and Radiation per Hour as the dependent variable.

By applying this function, an additional column can be added to table 2:

Imp's per 10 Seconds	Heliocentric Potential (MV)	Radiation µSv per Hour 68NO34E 50000 ft.	
		CARI-6	GLOBALOG
1718.63	0	24.94	24.59
1604.50	100	21.73	21.27
1514.50	200	18.52	18.81
1440.00	300	16.77	16.89
1377.50	400	15.01	15.36
1323.80	500	13.88	14.11
1276.30	600	12.74	13.04
1234.50	700	11.85	12.13
1197.00	800	11.15	11.35
1163.10	900	10.57	10.66
1137.90	1000	9.99	10.17
1110.00	1100	9.53	9.63
1084.10	1200	9.08	9.15
1060.20	1300	8.71	8.71
1038.10	1400	8.35	8.32
1017.50	1500	8.06	7.96
998.20	1600	7.76	7.63
980.10	1700	7.52	7.32
963.00	1800	7.28	7.04
946.90	1900	7.07	6.79
933.00	2000	6.87	6.57

Table 3

As mentioned above, the CARI-6 programme is called "a suitable computer programme" for the calculation of the crew members' radiation doses. It would therefore be relevant at this point to see how the calculated values correlate with the values calculated by the CARI-6 programme and the measured neutron figures, respectively:

GLOBALOG calculations vs. CARI-6:	$R^2 = 0.9989$
GLOBALOG calculations vs. neutron figures:	$R^2 = 0.9958$
CARI-6 calculations vs. neutron figures:	$R^2 = 0.9908$

Even though a correlation quotient of over 0.99 is in any case more than satisfactory, it is to be noticed that the GLOBALOG calculations are slightly more in conformity with reality than the CARI-6 calculations. The formula must consequently be considered as a valid method for the calculation of the radiation power.

The function's constants a, b and c are different from altitude to altitude. Table 4 shows these constants:

Altitude	a	b	c
50000	0.000009257414968	-0.001599999791921	0.000000000000174
49000	0.000008781603275	-0.001300000176539	-0.000000000000148
48000	0.000008297745865	-0.000999999759320	0.000000000000201
47000	0.000007803912981	-0.000700000158505	-0.000000000000133
46000	0.000007302999799	-0.000399999755073	0.000000000000205
45000	0.000006874876082	-0.000200000101143	-0.000000000000085
44000	0.000006373395768	0.000080000301831	0.000000000000252
43000	0.000005911405866	0.000299999928386	-0.000000000000060
42000	0.000005457858822	0.000500000370106	0.000000000000309
41000	0.000005077423050	0.000600000062584	0.000000000000052
40000	0.000004688942054	0.000699999748559	-0.000000000000210
39000	0.000004375180216	0.000700000303273	0.000000000000254
38000	0.000003917128440	0.000899999933012	-0.000000000000056
37000	0.000003538945313	0.000999999627311	-0.000000000000312
36000	0.000003239342957	0.001000000193471	0.000000000000162
35000	0.000002862768798	0.001099999889070	-0.000000000000093
34000	0.000002572177611	0.001099999654174	-0.000000000000289
33000	0.000002206866151	0.001200000167218	0.000000000000140
32000	0.000002012233838	0.001100000009889	0.000000000000008
31000	0.000001747065324	0.001099999795543	-0.000000000000171
30000	0.000001581073846	0.000999999661365	-0.000000000000283
29000	0.000001348407191	0.001000000281632	0.000000000000235
28000	0.000001128291575	0.001000000103703	0.000000000000087
27000	0.000000919760990	0.000999999935140	-0.000000000000054
26000	0.000000807189244	0.000900000005811	0.000000000000005
25000	0.000000630839267	0.000899999944095	-0.000000000000047
24000	0.000000555275291	0.000799999963847	-0.000000000000030
23000	0.000000488078250	0.000699999990363	-0.000000000000008
22000	0.000000351020868	0.000699999960408	-0.000000000000033
21000	0.000000307669714	0.000600000006200	0.000000000000005
20000	0.000000199510482	0.000599999999604	0.000000000000000
19000	0.000000186827545	0.000499999989352	-0.000000000000009
18000	0.000000103286568	0.000500000002657	0.000000000000002
17000	0.000000107015757	0.000400000005671	0.000000000000005
16000	0.000000039629475	0.000399999975450	-0.000000000000021
15000	0.000000063889932	0.000300000011228	0.000000000000009
14000	0.000000017517584	0.000299999989910	-0.000000000000008
13000	0	0.000268643045874	0
12000	0	0.000223298617014	0
11000	0	0.000186155127448	0
10000	0	0.000156615535039	0
9000	0	0.000129822965480	0
8000	0	0.000107927001377	0
7000	-0.000000007211141	0.000100000002254	0.000000000000002
6000	-0.000000010944472	0.000089999999237	0.000000000000000
5000	-0.000000012711566	0.000079999997808	-0.000000000000002
4000	-0.000000012190648	0.000069999998229	-0.000000000000001
3000	-0.000000010176484	0.000059999999857	0.000000000000000
2000	-0.000000015438019	0.000059999995604	-0.000000000000004
1000	-0.000000011325710	0.000049999998928	0.000000000000000
0	-0.000000006373453	0.000040000002931	0.000000000000002

As already mentioned the position database comprises three posts: **SearchData, MicroSievertPerHour** and **Coefficient.** The post **Coefficient** appears (as also mentioned) in that the radiation power in the reference point is divided into the radiation power for each of the 65.884 points - at each altitude - in the 3-dimensional net. It has turned out that the coefficient in each point is stable at changing radiation power.

The calculations are performed as follows:

1. A great circle arc is created between the airport of departure and the airport of arrival.
2. The arc is divided in a number of pieces which correspond to the same number of minutes of the flight.
3. The position and altitude are calculated according to each point of the great circle arc.
4. The radiation per hour is calculated in the reference point with the neutron counting number of the time by means of the function with the constants as indicated in Table 4, where the relevant constants are selected from the calculated altitude of the aircraft (cf. the profile of the aircraft) at the time in question.
5. The radiation power is corrected to the calculated position by getting the quotient for the actual position/altitude from the position database, and multiplying the radiation power of the reference point with the quotient.
6. The radiation dose is calculated as 1/60 of the result from point 5.
7. The time of sunrise and sunset in the point in question is calculated, and it is subsequently decided whether the latest minute of flying is to be characterised as "Flying time day" or "Flying time night".
8. When this is done for each of the many points of the route, the partial doses are summed up to the whole of the dose of the flight.
9. The dose of the flight is distributed to each of the crew members which are indicated on the crew list. - Details about the flight are furthermore indicated to the pilots, which is required by the rules for the keeping of flying time. For the rest of the crew members, including so-called passive transfers (crew members to/from active service from/to their base), flight information, which is necessary for identifying the flight in question later on, is indicated.
10. For pilots, the flying time is only summed up if the pilots have been on service as pilots. For a pilot who has been on board as a passenger (passive transfer), only the radiation columns are summed up. For all others flight crew members and passengers), all the columns are summed up.